General Specifications

Item	Specification
A/C Compressor	
Type	FS-10 swashplate, 5 double-acting pistons
Displacement	170 cc (10.4 cu in)
Rotation	Clockwise
A/C Pressure Relief Valve [a]	
Open pressures	3,792-4,137 kPa (550-600 psi)
A/C Pressure Sensor	**Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.**
Coolant Hose Lubricant	
MERPOL®	ESE-M99B144-B
Evaporator Core Orifice	
Color	Orange
Diameter	1.45 mm (0.057 in)
Magnetic Clutch	
Air gap clearance	0.35-0.75 mm (0.014-0.030 in)
Dual Function Pressure Switch (V8) [a]	
Fan on/open	2,137-2,344 kPa (310-340 psi)
Fan off/close	1,655-2,137 kPa (240-310 psi)
Clutch off/open	2,999-3,275 kPa (435-475 psi)
Clutch on/closed	1,517-1,931 kPa (220-280 psi)
Pressure Cutoff Switch (V6) [a]	
Open	2,999-3,275 kPa (435-475 psi)
Close	1,586-1,999 kPa (230-290 psi)
A/C Cycling Switch Open and Closed Pressures [a]	
Open pressure	145-159 kPa (21-23 psi)
Close pressure	290 kPa (42 psi)
Refrigerant Lubricant and Capacity	
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B
Capacity	254 ml (8.6 oz)
Refrigerant and Capacity	
R134a Refrigerant YN-19	WSH-M17B19-A
Capacity	.96 kg (34 oz)
Refrigerant System Cleaner	
A/C Systems Flushing Solvent F4AZ-19579-A	—

[a] Manifold gauge set pressures may vary slightly depending on the distance between the service

gauge port valve and the A/C pressure relief valve, the A/C cycling switch, the pressure cutoff switch (V6), and the dual function pressure switch (V8) location.

Torque Specifications

Description	Nm	lb-in
Peanut fitting nut	8	71

Climate Control System

WARNING: To avoid accidental deployment and possible injury, the air bag system backup power supply must be depleted before repairing any climate control components. To deplete the backup power supply, disconnect the battery ground cable and wait one minute. Failure to follow these instructions may result in personal injury.

WARNING: Carbon monoxide is colorless, odorless and dangerous. If it is necessary to operate the engine with the vehicle in a closed area such as a garage, always use an exhaust collector to vent the exhaust gases outside the closed area.

WARNING: R-134a is classified as a safe refrigerant, but misuse can make it dangerous. The following precautions must be observed:

- **Always wear safety goggles when repairing an air conditioning system.**
- **Avoid contact with liquid refrigerant R-134a. R-134a vaporizes at approximately -25°C (-13°F) under atmospheric pressure and it will freeze skin tissue.**
- **Never allow refrigerant R-134a gas to escape in quantity in an occupied space. R-134a is non-toxic, but it will displace the oxygen needed to support life.**
- **Never use a torch in an atmosphere containing R-134a gas. R-134a is non-toxic at all normal conditions, but when it is exposed to high temperatures, such as a torch flame, it decomposes. During decomposition it releases irritation and toxic gases (as described in the MSDS sheet from the manufacturer). Decomposition products are hydrofluoric acid, carbon dioxide and water.**
- **Do not allow any portion of the charged air conditioning system to become too hot. The pressure in an air conditioning system rises as the temperature rises and temperatures of approximately 85°C (185°F) can be dangerous.**
- **Allow the engine to cool sufficiently prior to carrying out maintenance or serious burns and injury can occur.**

CAUTION: To avoid damaging the vehicle or A/C components, the following precautions must be observed:

- **The A/C refrigerant of all vehicles must be identified and analyzed prior to refrigerant charging. Failure to due so can contaminate the shop bulk refrigerant and other vehicles.**
- **Do not add R-12 refrigerant to an A/C system that requires the use of R-134a refrigerant. These two types of refrigerant must never be mixed. Doing so can damage the A/C system.**
- **Charge the A/C system with the engine running only at the low-pressure side to prevent refrigerant slugging from damaging the A/C compressor.**
- **Use only R-134a refrigerant. Due to environmental concerns, when the air conditioning system is drained, the refrigerant must be collected using refrigerant recovery/recycling equipment. Federal law REQUIRES that R-134a be recovered into appropriate recovery equipment and the process be conducted by qualified technicians who have been certified by an approved organization, such as MACS, ASI etc. Use of a recovery machine dedicated to R-134a is necessary to reduce the possibility of oil and refrigerant incompatibility concerns. Refer to the instructions provided by the equipment manufacturer when removing refrigerant from or charging the air conditioning system.**

- **Refrigerant R-134a must not be mixed with air for leak testing or used with air for any other purpose above atmospheric pressure. R-134a is combustible when mixed with high concentrations of air and higher pressures.**
- **A number of manufacturers are producing alternative refrigerant products that are designed to be used instead of R-134a refrigerant. The use of any unauthorized substitute refrigerant can severely damage the A/C components. If repair is required, use only new or recycled refrigerant R-134a.**

CAUTION: To avoid contamination of the A/C system, always observe the following:

- **Keep service tools and the work area clean.**
- **Never open or loosen a connection before discharging the system.**
- **When loosening a connection, if any residual pressure is evident, allow it to leak out before opening the fitting.**
- **Evacuate a system that has been opened to install a new component or one that has been discharged through leakage before charging.**
- **Seal an open fitting with a cap or plug immediately after disconnecting a component from the system.**
- **Clean the outside of the fittings thoroughly before disconnecting a component from the system.**
- **Do not remove the sealing caps from a new component until ready to install.**
- **Refrigerant oil will absorb moisture from the atmosphere if left uncapped. Do not open an oil container until ready to use, and install the cap immediately after using. Store the oil in a clean, moisture-free container.**
- **Install a new O-ring seal before connecting an open fitting. Coat the fitting and the O-ring seal with refrigerant oil before connecting.**
- **When installing a refrigerant line, avoid sharp bends. Position the line away from the exhaust or any sharp edges that can chafe the line.**
- **Do not open a refrigerant system or uncap a new component unless it is as close as possible to room temperature. This will prevent condensation from forming inside a component that is cooler than the surrounding air.**

The manual climate control system heats or cools the vehicle depending on the function selector switch position and the temperature selected.

- The function selector switch position determines heating or cooling and air distribution.
- The temperature control setting determines the air temperature.
- The heater blower motor switch (18578) varies the blower motor speed.

Principles of Operation

There are four main principles involved with the basic theory of operation:

- heat transfer
- latent heat of vaporization
- relative humidity
- effects of pressure

Heat Transfer

If two substances of different temperature are placed near each other, the heat in the warmer substance will transfer to the colder substance.

Latent Heat of Vaporization

When a liquid boils (converts to a gas), it absorbs heat without raising the temperature of the resulting gas. When the gas condenses (reverts back to a liquid), it gives off heat without lowering the temperature of the resulting liquid.

Relative Humidity

The amount of moisture (water vapor content) that the air can hold is directly related to the air temperature. The more heat there is in the air, the more moisture the air can hold. The lower the moisture content in the air, the more comfortable you feel. Removing moisture from the air lowers its relative humidity and improves personal comfort.

Effects of Pressure on Boiling or Condensation

As the pressure is increased on a liquid, the temperature at which the liquid boils (converts to a gas) also increases. Conversely, when the pressure on a liquid is reduced, its boiling point is also reduced. When in the gas state, an increase in pressure causes an increase in temperature, while a decrease in pressure will decrease the temperature of the gas.

Compressor Anti-Slugging Strategy

Liquid refrigerant may accumulate in the A/C compressor under certain conditions. To alleviate damage to the A/C compressor, compressor anti-slugging strategy (CASS) is utilized.

CASS is initiated only under specific conditions:

- the ignition is off for more than 8 hours
- the ambient temperature is above -4ºC (25ºF)
- battery voltage is above 8.5 volts during engine cranking

When these conditions are present, the powertrain control module (PCM) will activate the A/C control relay prior to cranking of the engine. The A/C control relay engages the A/C compressor for approximately 4-15 A/C compressor revolutions or a maximum of 2 seconds (depending upon vehicle application), allowing the liquid refrigerant to be pushed from the A/C compressor. CASS is initiated by the PCM regardless of the function selector switch position or the EATC system settings.

The Refrigerant Cycle

During stabilized conditions (air conditioning system shut down), the refrigerant is in a vaporized state and pressures are equal throughout the system. When the A/C compressor (19703) is in operation, it increases pressure on the refrigerant vapor, raising its temperature. The high-pressure and high-temperature vapor is then released into the top of the A/C condenser core (19712).

The A/C condenser core, being close to ambient temperature, causes the refrigerant vapor to condense into a liquid when heat is removed from the refrigerant by ambient air passing over the fins and tubing. The now liquid refrigerant, still at high pressure, exits from the bottom of the A/C condenser core and enters the inlet side of the A/C evaporator core orifice (19D990).

The A/C evaporator core orifice is the restriction in the refrigerant system that creates the high pressure buildup upstream of the A/C evaporator core (19860) and separates the high and low pressure sides of the A/C system. As the liquid refrigerant leaves this restriction, its pressure and boiling point are reduced.

The liquid refrigerant is now at its lowest pressure and temperature. As it passes through the A/C

evaporator core, it absorbs heat from the passenger compartment airflow passing over the plate/fin sections of the A/C evaporator core. This addition of heat causes the refrigerant to boil (convert to a gas). The now cooler passenger compartment air can no longer support the same humidity level of the warmer air and this excess moisture condenses on the exterior of the evaporator coils and fins and drains outside the vehicle.

The suction accumulator/drier (19C836) is designed to remove moisture from the refrigerant and to prevent any liquid refrigerant that may not have been vaporized in the A/C evaporator core from reaching the A/C compressor. The A/C compressor is designed to pump refrigerant vapor only, as liquid refrigerant will not compress and can damage the A/C compressor.

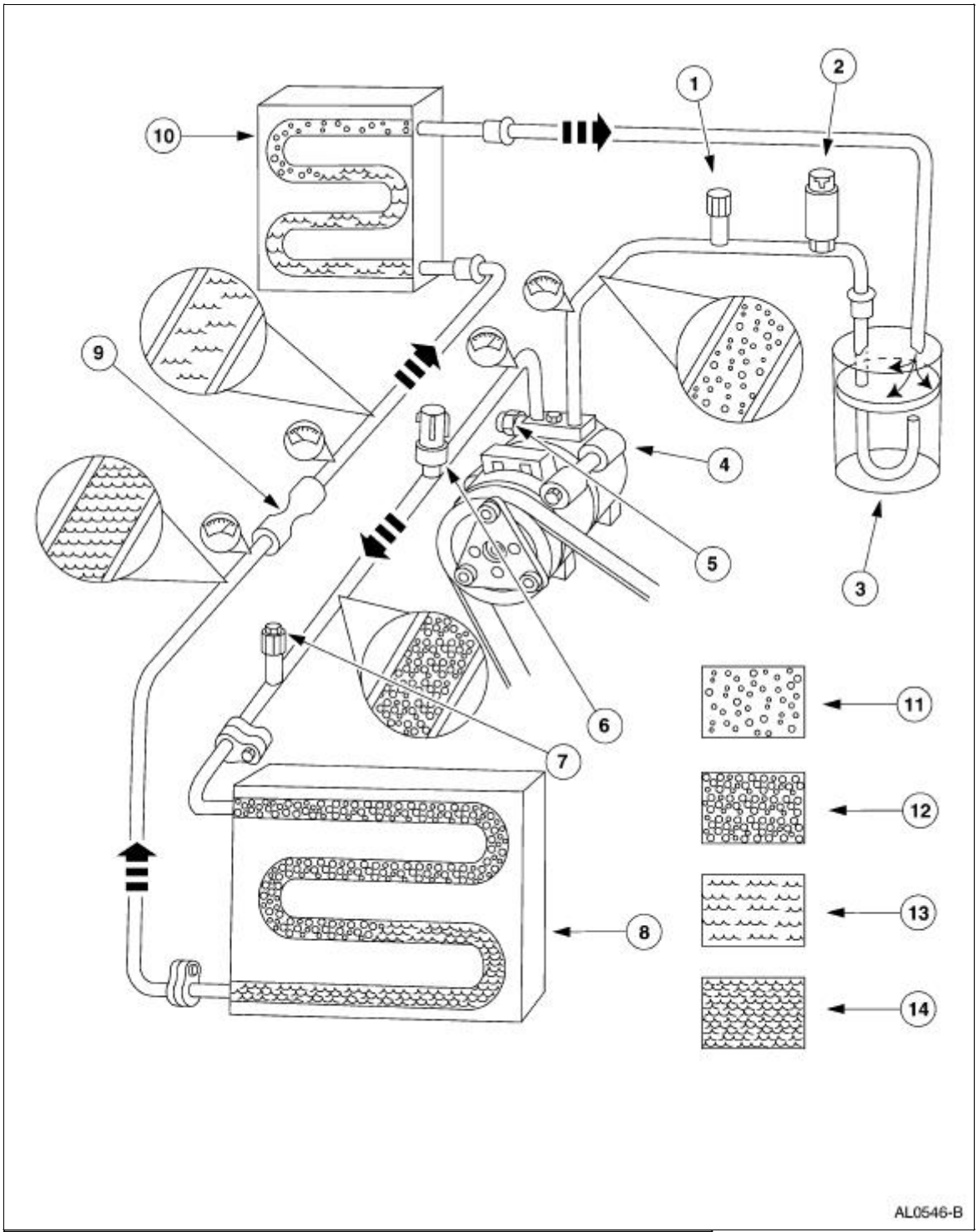
The refrigerant cycle is now repeated with the A/C compressor again increasing the pressure and temperature of the refrigerant.

The A/C cycling switch (19E561) interrupts compressor operation before the external temperature of the A/C evaporator core gets low enough to cause the condensed water vapor (excess humidity) to turn to ice. It does this by monitoring low side line pressure. It is known that a refrigerant pressure of approximately 210 kPa (30 psi) will yield an operating temperature of 0°C (32°F). The A/C cycling switch controls system operation in an effort to maintain this temperature.

The high side line pressure is also monitored so that the A/C compressor operation can be interrupted if system pressure becomes too high.

The A/C compressor pressure relief valve (19D644) will open and vent refrigerant to relieve unusually high system pressure.

Clutch Cycling Orifice Tube Type Refrigerant System

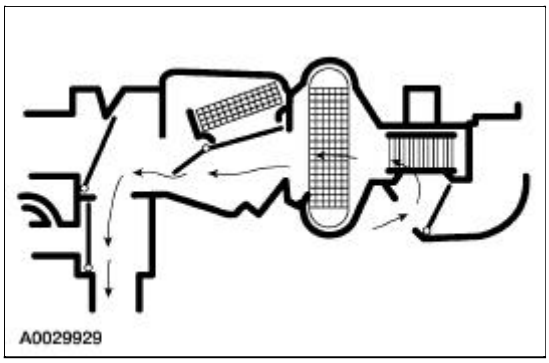


Item	Part Number	Description
1	19D701	A/C charge valve port (low side)
2	19E561	A/C cycling switch
3	19C836	Suction accumulator/drier
4	19703	A/C compressor
5	19D644	A/C compressor pressure relief valve
6	19D594	A/C pressure cutoff switch
7	19D701	A/C charge valve port (high side)
8	19712	A/C condenser core

9	19D990	A/C evaporator core orifice
10	19860	A/C evaporator core
11	—	Low pressure vapor
12	—	High pressure vapor
13	—	Low pressure liquid
14	—	High pressure liquid

System Air Flow Description

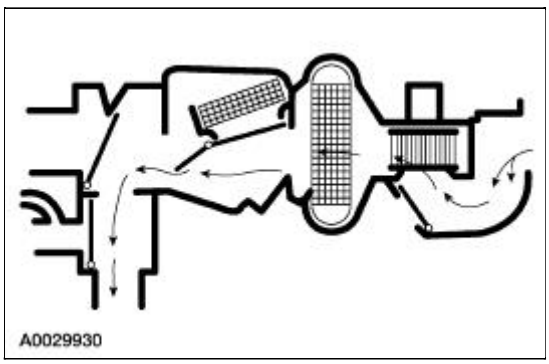
MAX A/C



When MAX A/C is selected:

- The air inlet door vacuum control motor is at full vacuum, closing off outside air and admitting only recirculated air.
- The panel/defrost door vacuum control motor is at full vacuum and the panel/floor door vacuum control motor is at no vacuum, directing airflow to the instrument panel A/C registers. A small amount of airflow from the side window demisters will be present.
- Blended air temperature is available.
- The A/C compressor will operate if the outside temperature is above approximately 6°C (43°F).
- The blower motor is on.

NORM A/C

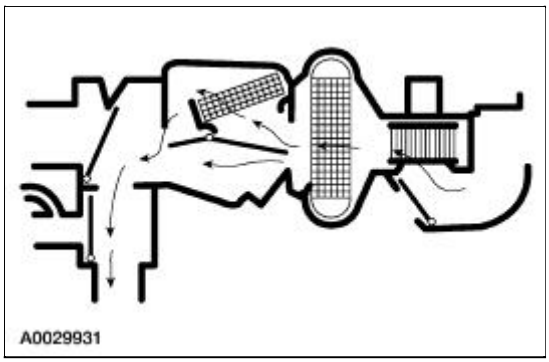


When NORM A/C is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.

- The panel/defrost door vacuum control motor is at full vacuum and the panel/floor door vacuum control motor is at no vacuum, directing airflow to the instrument panel A/C registers. A small amount of airflow from the side window demisters will be present.
- Blended air temperature is available.
- The A/C compressor will operate if the outside air temperature is above approximately 6°C (43° F).
- The blower motor is on.

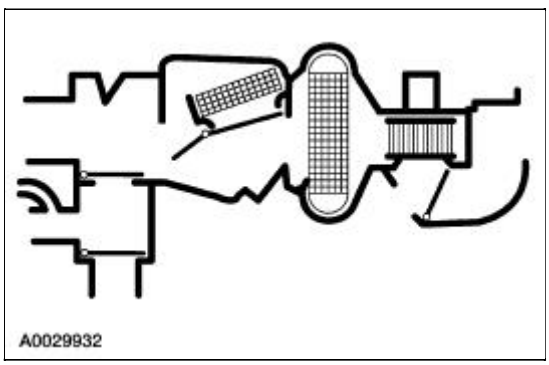
PANEL



When PANEL is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
- The panel/defrost door vacuum control motor is at full vacuum and the panel/floor door vacuum control motor is at no vacuum, directing airflow to the instrument panel A/C registers. A small amount of airflow from the side window demisters will be present.
- The temperature can be adjusted to heat the air, but the air cannot be cooled below the outside temperature.
- The A/C compressor will not operate.
- The blower motor is on.

OFF



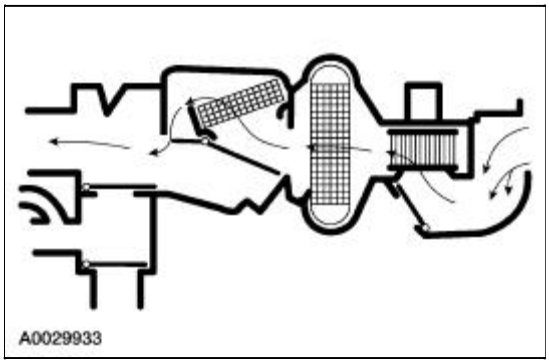
When OFF is selected:

- The air inlet door vacuum control motor is at full vacuum, closing off outside air from entering the passenger compartment.
- The panel/floor door vacuum control motor is at full vacuum and the panel/defrost door vacuum

control motor is at no vacuum, closing off airflow to the defrost duct, side window demisters, floor duct and instrument panel A/C registers.

- The A/C compressor will not operate.
- The blower motor is off.

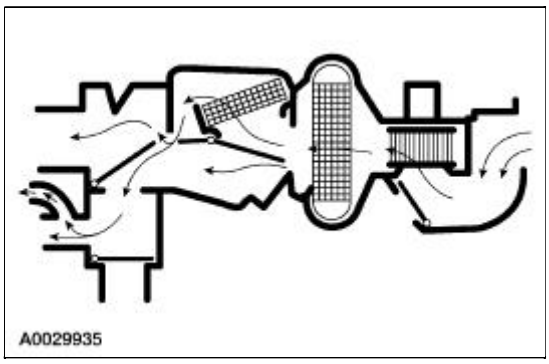
FLOOR



When FLOOR is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
- The panel/floor door vacuum control motor is at full vacuum and the panel/defrost door vacuum control motor is at no vacuum, directing airflow to the floor duct. A small amount of airflow from the side window demisters will be present.
- The temperature can be adjusted to heat the air, but the air cannot be cooled below the outside temperature.
- The A/C compressor will not operate.
- The blower motor is on.

FLOOR/DEFROST

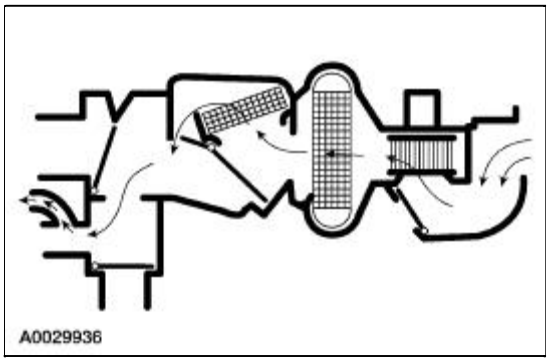


When FLOOR/DEFROST is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
- The panel/floor door vacuum control motor is at partial vacuum and the panel/defrost door vacuum control motor is at no vacuum, directing airflow to the floor duct, the defroster duct, and the side window demisters.
- The temperature can be adjusted to heat or cool the air below the outside temperature.

- The A/C compressor will operate if the outside air temperature is above approximately 6°C (43° F).
- The blower motor is on.

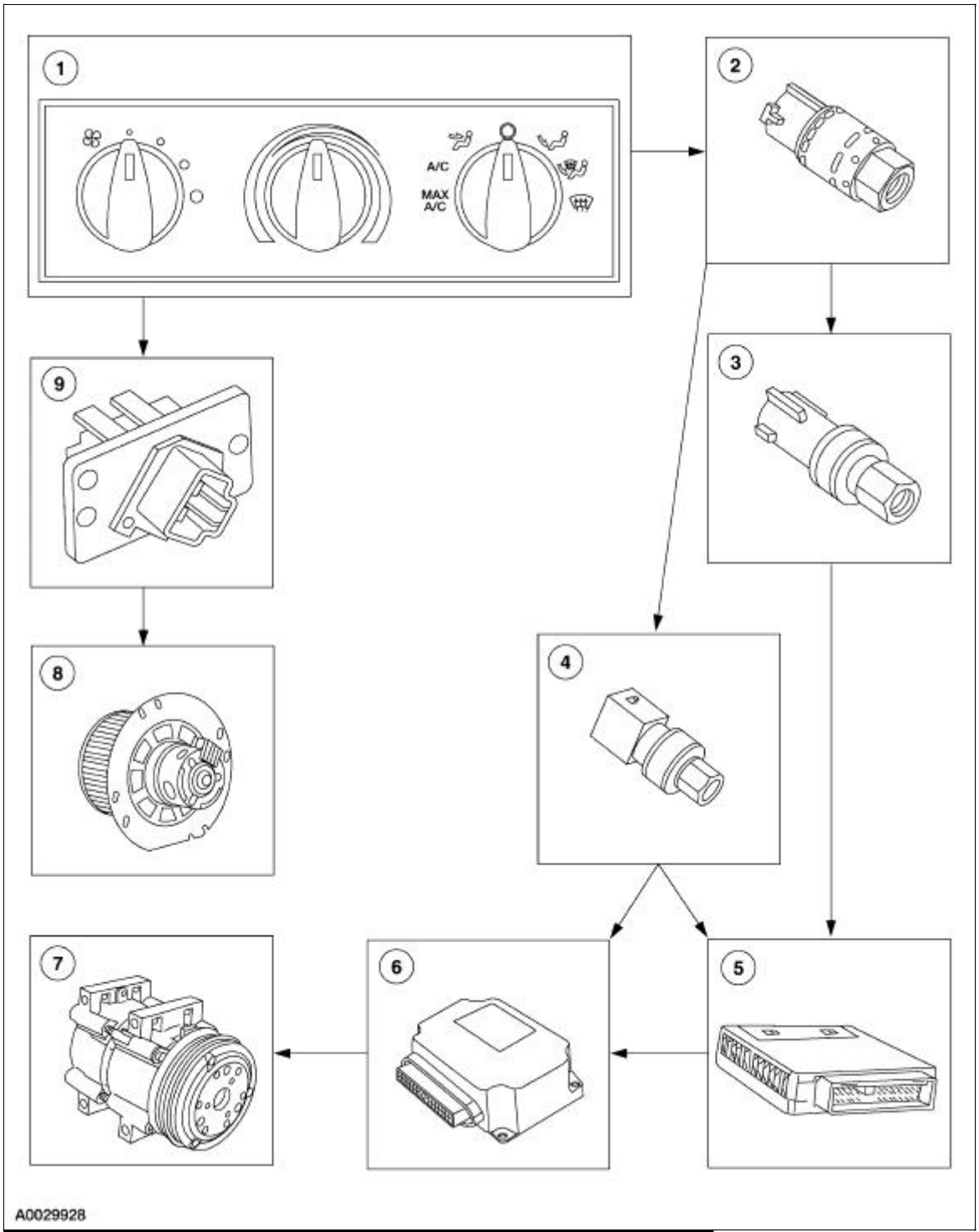
DEFROST



When DEFROST is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
- The panel/floor door and panel/defrost door vacuum control motors are at no vacuum, directing airflow to the defroster duct and the side window demisters.
- The temperature can be adjusted to heat or cool the air below the outside temperature.
- The A/C compressor will operate if the outside air temperature is above approximately 6°C (43° F).
- The blower motor is on.

Electrical Components



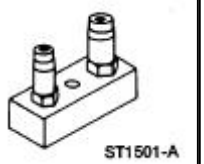
Item	Part Number	Description
1	19980	Manual A/C control assembly
2	19E561	A/C cycling switch
3	19D594	A/C pressure cutoff switch (V6)
4	19D594	A/C pressure cutoff switch (V8)
5	12A650	Powertrain control module
6	12B581	Constant control relay module
7	19703	A/C compressor
8	19805	Blower motor

9	18591	Heater blower motor resistor

Climate Control System

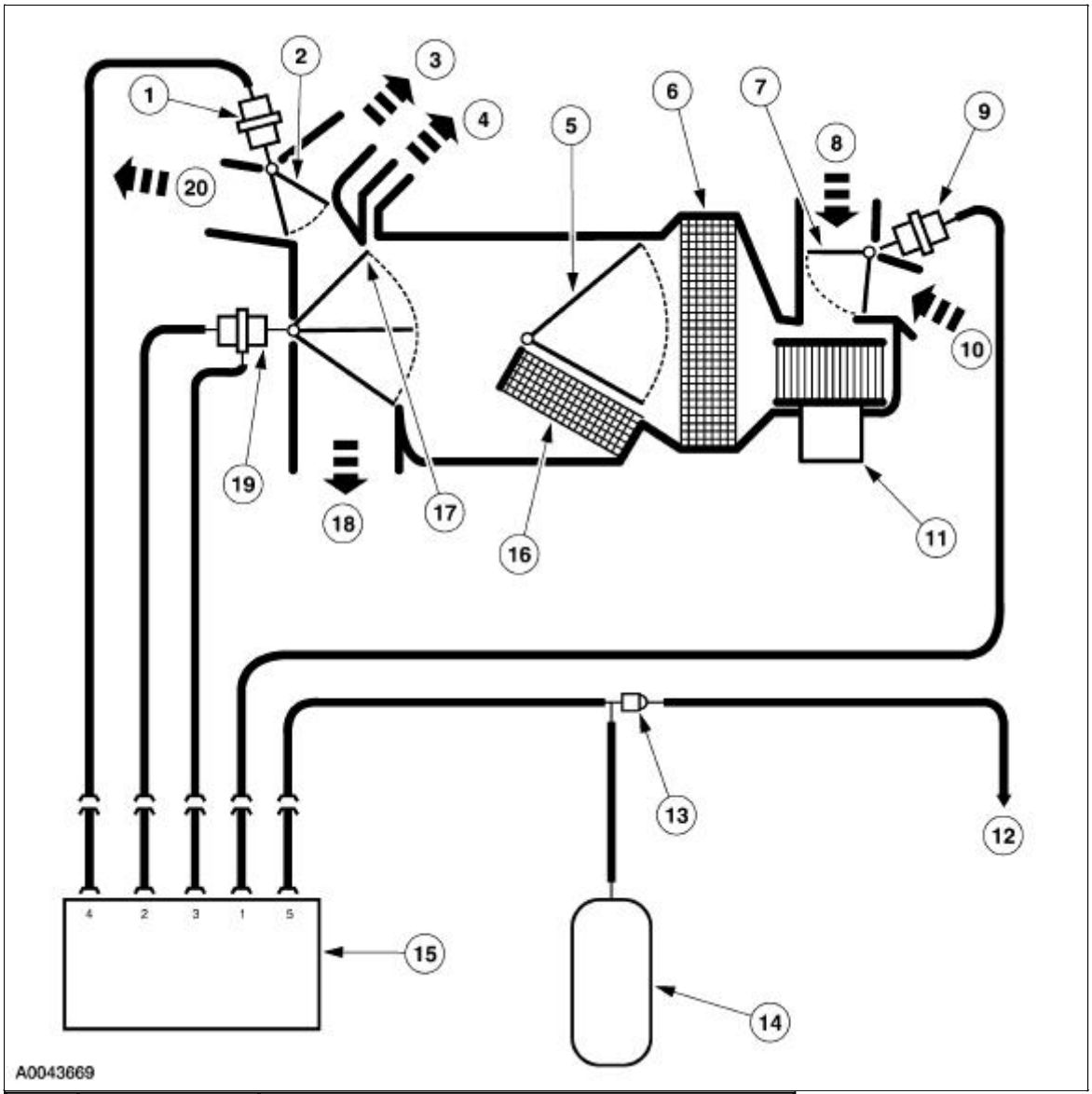
Refer to Wiring Diagrams Cell 54 , Air Conditioner/Heater for schematic and connector information.

Special Tool(s)

 ST1501-A	Connector, Refrigerant Pressure Line 412-093 (T94P-19623-E)
ST1252-A	Set, A/C Fittings 412-DS028 (014-00333, D93L-19703-B) or equivalent
ST1176-A	Vacuum Pump Kit 416-D002 (D95L-7559-A) or equivalent
ST1391-A	Breakout Box, EEC-V Control System 418-049 (014-00950, T94L-50-EEC-V)
ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool
ST1474-A	Pressure Test Kit 014-R1072 or equivalent
	77 III Automotive Meter 105-R0056 or equivalent

ST1137-A	
ST1928-A	R-134a Manifold Gauge Set 176-R032A or equivalent
ST2351-A	Refrigerant Leak Detector 216-00001 or equivalent

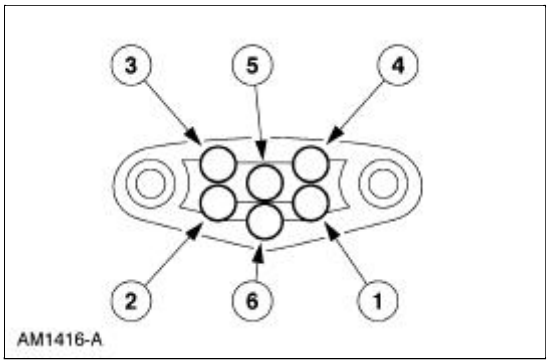
Vacuum Schematic—Manual Climate Control System



Item	Part Number	Description
1	18A318	Vacuum control motor, panel/defrost door
2	18A478	Panel/defrost door (full vacuum position)
3	—	Defrost airflow
4	—	Side window demister airflow
5	18B545	Temperature blend door (full heat position)
6	19860	A/C evaporator core
7	19A813	Air inlet door (full vacuum position)
8	—	Outside air inlet
9	18A318	Vacuum control motor—air inlet door
10	—	Recirculated air inlet
11	19805	Blower motor
12	—	Vacuum from the engine intake manifold
13	19A563	A/C vacuum check valve
14	19A566	A/C vacuum reservoir tank and bracket
15	19B888	A/C-heater function selector switch

16	18476	Heater core
17	18A559	Panel/floor door (full vacuum position)
18	—	Floor airflow
19	18A318	Vacuum control motor—floor/panel door
20	—	Panel vent airflow

Function Selector Switch Vacuum Connector



Port No.	Hose Color	Function
1	White	Air inlet door
2	Red	Panel/floor door
3	Blue	Panel/floor door
4	Yellow	Panel/defrost door
5	Black	Vacuum source
6	—	Not used

Function Selector Switch Vacuum Application Chart

Switch Port	Color	Function	Function Selector Switch Position						
			MAX A/C	A/C	Vent	OFF	Floor	FLR/ DEF	Defrost
1	White	Recirc/Fresh	V	NV	NV	V	NV	NV	NV
2	Red	Floor	NV	NV	NV	V	V	NV	NV
3	Blue	Panel/floor	NV	NV	NV	V	V	V	NV
4	Yellow	Panel/defrost	V	V	V	NV	NV	NV	NV
5	Black	Vacuum source	V	V	V	V	V	V	V

V=Vacuum

NV=No Vacuum

Inspection and Verification

1. Verify the customer's concern by operating the climate control system to duplicate the condition.

2. Inspect to determine if one of the following mechanical or electrical concerns apply:

Visual Inspection Chart

Mechanical	Electrical
● Loose, missing or damaged A/C compressor drive belt. ● Loose or disconnected A/C clutch. ● Loose, misrouted or damaged vacuum lines. [a] ● Broken or leaking refrigerant lines. ● Broken or leaking vacuum control motor.	● Open fuses. ● Blower motor inoperative. ● A/C compressor inoperative. ● Circuitry open/shorted. ● Disconnected electrical connectors.

[a] A leak in the vacuum control circuit may occur during acceleration (slow leak), at all times (large leak), or only when specific functions are selected (indicating a leak in that portion of the circuit). The vacuum hoses used in the passenger compartment control circuit are constructed from PVC plastic material. The vacuum hoses used in the engine compartment are constructed of Hytrel®. Because of the materials used, never pinch the vacuum hoses off during diagnosis to locate a leak. A wood golf tee can be used as a plug when it is necessary to plug one end of a vacuum hose for leak test purposes.

3. If the inspection reveals obvious concerns that can be readily identified, repair as required.

4. If the concern remains after the inspection, connect the scan tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the scan tool menu. If the vehicle selection cannot be entered:
   - check that the program card is correctly installed.
   - check the connections to the vehicle.
   - check the ignition switch position.

If the scan tool still does not allow the vehicle selection to be entered, refer to the scan tool manual.

5. Carry out the DATA LINK DIAGNOSTIC TEST using the scan tool. If the scan tool responds with:
   - CKT 914, CKT 915 or CKT 70 = ALL MODULE NO RESPONSE/NOT EQUIPPED, go to Communication System Diagnostics in Section 418-00 to diagnose network concern.
   - If the powertrain control module (PCM) is not listed for a communication concern, turn the A/C function selector switch to OFF and execute self-test diagnostics for the PCM.

6. If any PCM DTCs are retrieved, and are related to the concern, go to the Powertrain Control Module Diagnostic Trouble Code (DTC) Index to continue diagnostics.

7. If no DTCs related to the concern are retrieved, go to the Symptom Chart to continue diagnostics.

Powertrain Control Module Diagnostic Trouble Code (DTC) Index

DTC	Description	Action
P1460	WOT A/C cutout circuit malfunction	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1464	A/C demand out of self-test range	GO to DTC P1464.

Symptom Chart

Symptom Chart

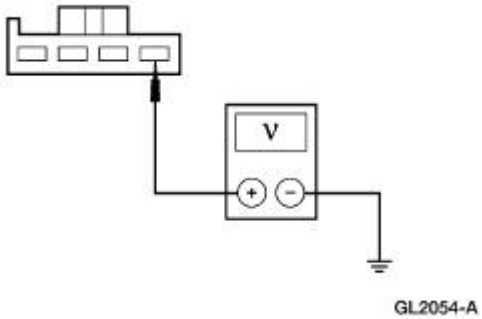
Condition	Possible Sources	Action
• Incorrect/erratic direction of airflow from outlet(s)	• No vacuum to A/C heater function switch selector. • A/C heater function selector switch leaks vacuum. • Kinked/pinched vacuum hose. • Leaking vacuum control motor. • Leaking A/C vacuum check valve. • Leaking A/C vacuum reservoir tank and bracket. • Vacuum actuator arm not connected to door crank.	• Go To Pinpoint Test A .
• Insufficient, erratic, or no heat	• Low engine coolant level. • Thermostat stuck open. • Disengaged/damaged temperature cable.	• Go To Pinpoint Test B .
• The A/C does not operate/does not operate correctly	• CASS strategy failure. • Open fuses. • A/C clutch relay. • Shorted blend door actuator. • Powertrain control module. • Circuitry short/open. • A/C cycling switch damaged. • A/C system discharged/low charge. • Function selector switch damaged. • A/C pressure cut-off switch damaged. • A/C compressor clutch damaged.	• Go To Pinpoint Test C .
• The A/C is always on	• Circuitry short/open. • A/C cycling switch. • A/C heater function selector switch. • Constant control relay module. • Incorrect A/C clutch air gap.	• Go To Pinpoint Test D .
• Insufficient A/C cooling	• Restricted A/C evaporator core orifice. • Low refrigerant level.	• Go To Pinpoint Test E .
• No operation in all the temperature settings	• Damaged blend door actuator cable. • Damaged air temperature control door.	• Go To Pinpoint Test F .
• The blower motor does not operate	• Open fuse. • Circuitry open/shorted. • Damaged heater blower motor switch (18578). • Damaged heater blower motor switch resistor (18591). • Damaged blower motor relay. • Damaged blower motor.	• Go To Pinpoint Test G .
• The blower motor operates continuously in	• Circuitry short/open. • Damaged heater blower	• Go To Pinpoint

high speed	motor switch resistor. ● Damaged heater blower motor switch.	Test H .
● No operation in high blower setting	● Circuitry short/open. ● Damaged heater blower motor switch.	● Go To Pinpoint Test I .
● No operation in lower speeds	● Circuitry short/open. ● Damaged heater blower motor switch resistor. ● Damaged heater blower motor switch.	● Go To Pinpoint Test J .

Pinpoint Tests

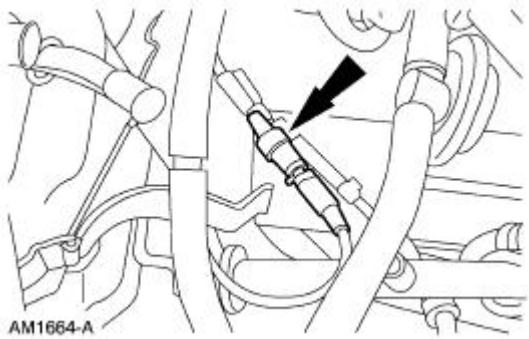
PINPOINT TEST P1464: DTC P1464: A/C DEMAND OUT OF SELF-TEST RANGE

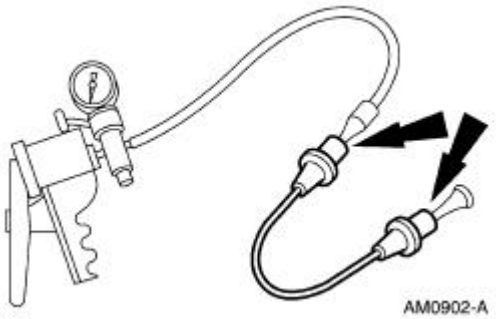
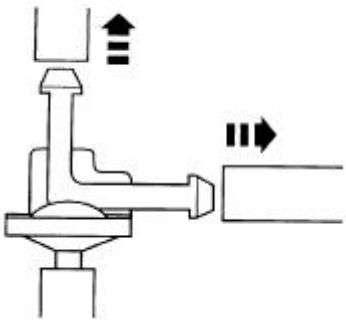
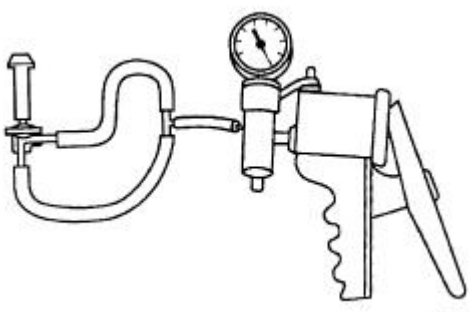
Test Step	Result / Action to Take
P14641 RECHECK FOR THE DTC ● Key in ON position. ● Make sure the function selector switch is in the OFF position. ● Enter the following diagnostic mode on the diagnostic tool: PCM Self-Test. ● **Is DTC P1464 retrieved?**	**Yes** GO to P14642 . **No** The system is functioning correctly. This DTC will set if the A/C is turned on when carrying out the PCM self-test.
P14642 CHECK PID ACCS WITH THE A/C CONTROL DISCONNECTED ● Key in OFF position. ● Disconnect: Function Selector Switch C294c. ● Key in ON position. ● Enter the following diagnostic mode on the diagnostic tool: PCM PID ACCS. ● **Does PID ACCS read ON?**	**Yes** GO to P14643 . **No** INSTALL a new function selector switch. REFER to Section 412-04 . REPEAT the PCM self-test and verify DTC P1464 is no longer retrieved.
P14643 CHECK CIRCUIT 348 (VT) FOR A SHORT TO B+ ● Key in OFF position. ● Disconnect: PCM C175. ● Key in ON position. ● Measure the voltage at the function selector switch C294c-4, circuit 348 (VT), the harness side and ground.	**Yes** REPAIR circuit 348 (VT) for a short to B+. REPEAT the PCM self-test and verify DTC P1464 is no longer retrieved. **No** INSTALL a new powertrain control module. REFER to Section 303-14 . REPEAT the PCM self-test and verify DTC P1464 is no longer retrieved.

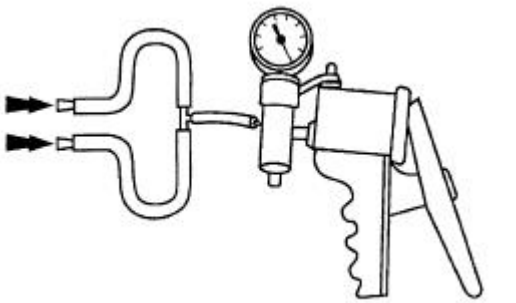
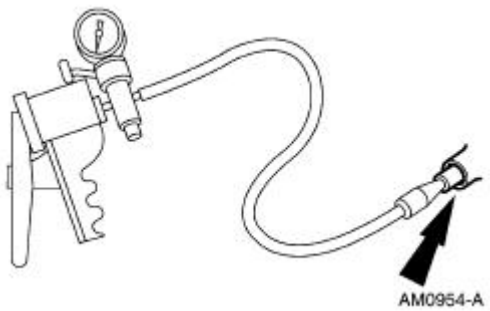
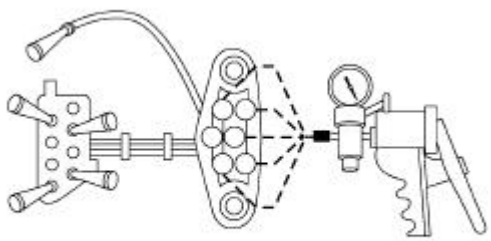


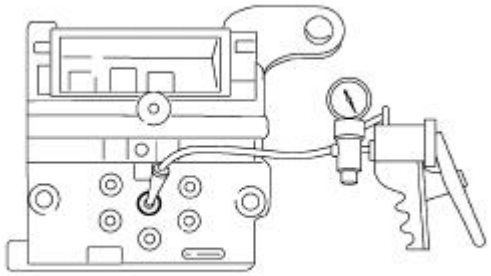
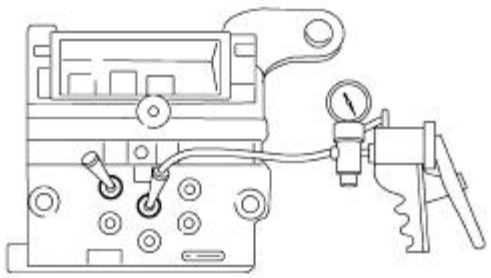
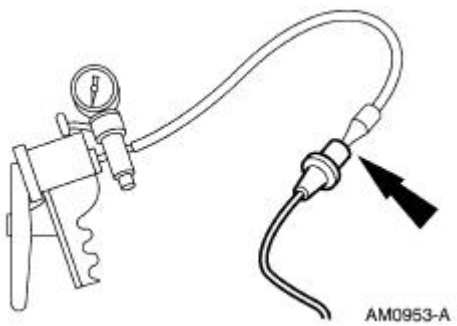
- **Is there voltage present?**

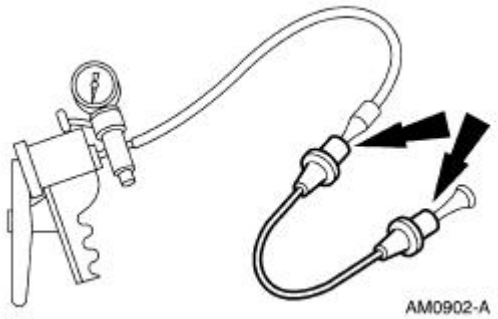
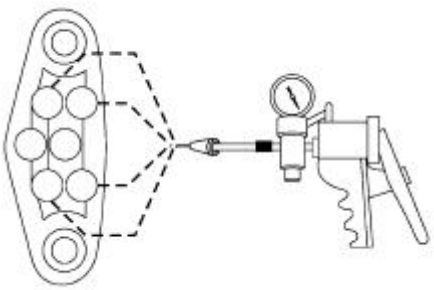
PINPOINT TEST A: INCORRECT/ERRATIC DIRECTION OF AIRFLOW FROM OUTLET

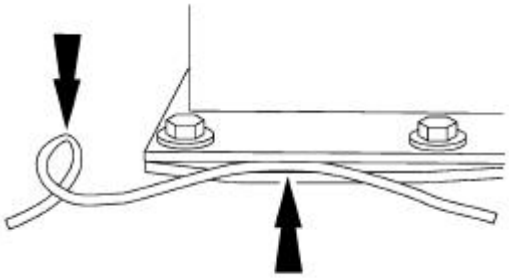
Test Step	Result / Action to Take
A1 CHECK AIRFLOW FROM DEFROSTER OUTLETS	
• Key in START position. • Place the heater blower motor switch in the HI position and rotate the function selector switch to each position. • Check for correct airflow from each function selector switch position at engine idle and during engine speed acceleration. • **Is there airflow from defroster outlets under all conditions?**	**Yes** GO to A2 . **No** If the airflow is from defroster outlets in all switch positions only under engine speed acceleration, GO to A19 . If the airflow is incorrect under one or more conditions, GO to A13 . If the airflow is correct under all conditions, RETURN to the Symptom Chart.
A2 CHECK THE VACUUM SUPPLY HOSE	
• Key in OFF position. • Verify the vacuum supply hose is connected between the engine manifold and the A/C vacuum check valve.  • **Is the hose connected?**	**Yes** GO to A3 . **No** RECONNECT the hose. TEST the system for normal operation.
A3 LEAK CHECK THE VACUUM SUPPLY HOSE	

• Disconnect: Vacuum Supply Hose. • Connect one end of the vacuum supply hose to a vacuum pump and test for leaks.  AM0902-A • **Does the hose leak?**	**Yes** REPAIR or INSTALL a new vacuum hose. TEST the system for normal operation. **No** GO to A4 .
A4 CHECK THE VACUUM CHECK VALVE	
• Key in START position. • Check the A/C vacuum check valve for correct installation by removing (one at a time) the reservoir hose and the control assembly source hose from the A/C vacuum check valve. Check for vacuum.  GL1016-A • **Is vacuum available at both check valve ports?**	**Yes** GO to A6 . **No** GO to A5 .
A5 INSPECT THE VACUUM CHECK VALVE	
• Key in OFF position. • Disconnect: A/C Vacuum Check Valve. • Inspect the A/C vacuum check valve for an obstruction and correct operation. Airflow through the A/C vacuum check valve should be in the direction toward the engine (engine connection site is marked "VAC"). • **Is the A/C vacuum check valve plugged or obstructed?**	**Yes** INSTALL a new A/C vacuum check valve. TEST the system for normal operation. **No** GO to A6 .
A6 LEAK TEST THE VACUUM CHECK VALVE	
• Key in OFF position. • Disconnect: Vacuum Check Valve. • Connect the A/C vacuum check valve to a vacuum pump with two hoses and a tee fitting.  GL1017-A	**Yes** INSTALL a new A/C vacuum check valve. TEST the system for normal operation. **No** RECONNECT the A/C vacuum check valve. GO to A7 .

• Pump 51 kPa (15 in-Hg) vacuum on the A/C vacuum check valve and observe the gauge reading. • If the vacuum loss exceeds 3.37 kPa (1 in-Hg) per minute, remove the A/C vacuum check valve from the tester and plug the vacuum hoses. Pump 51 kPa (15 in-Hg) of vacuum with the tester to be certain the hoses and tester are not the cause of the leak.  GL1018-A • **Does the A/C vacuum check valve lose more than 3.37 kPa (1 in-Hg) of vacuum in one minute?**	
A7 CHECK THE VACUUM RESERVOIR	
• Disconnect: A/C Vacuum Reservoir Tank. • Use a vacuum pump to leak test the A/C vacuum reservoir tank.  AM0954-A • **Does the reservoir leak?**	**Yes** INSTALL a new A/C vacuum reservoir tank. TEST the system for normal operation. **No** RECONNECT the A/C vacuum reservoir tank. GO to A8 .
A8 CHECK THE SUPPLY HOSE	
• Disconnect: Function Selector Switch Supply Hose. • Use a vacuum pump to leak test the function selector switch supply hose.  AM2194-A • **Does the function selector switch supply hose leak?**	**Yes** REPAIR or INSTALL a new function selector switch supply hose. TEST the system for normal operation. **No** RECONNECT the function selector switch supply hose. GO to A9 .
A9 CHECK THE CONTROL ASSEMBLY	
• Disconnect: In-line Vacuum Harness. • Connect a vacuum pump to the black hose and plug the other hoses.	**Yes** NOTE the function selector switch position where the vacuum drops. GO to A10 .

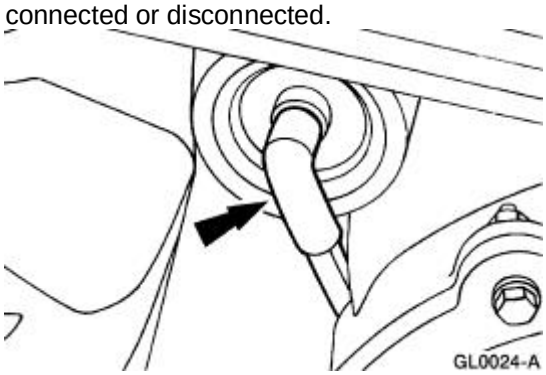
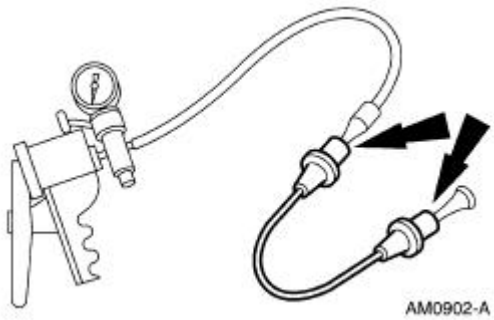
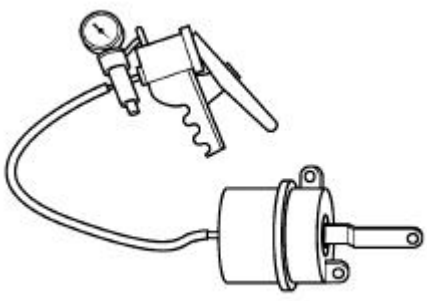
 AM2195-A ● At each function selector switch position, apply 51 kPa (15 in-Hg) of vacuum and check for vacuum drop. ● **Does the vacuum drop exceed 3.37 kPa (1 in-Hg) per minute?**	**No** RECONNECT the in-line vacuum harness connector. GO to A11 .
A10 LEAK TEST THE CONTROL ASSEMBLY	
● Disconnect: Function Selector Switch Vacuum. ● Connect a vacuum pump to the function selector switch supply port and plug the control port that indicated a leak in Step A9.  AM2196-A ● Select the function selector switch position that indicated a leak in Step A9 and then apply 51 kPa (15 in-Hg) of vacuum. ● **Does the vacuum drop exceed 1.68 kPa (0.5 in-Hg) per minute?**	**Yes** INSTALL a new function selector switch. TEST the system for normal operation. **No** RECONNECT the function selector switch vacuum connector. GO to A12 .
A11 CHECK THE SUPPLY HOSE FOR OBSTRUCTIONS	
● Disconnect: Mode Selector Switch Supply Hose. ● Connect a vacuum pump to the supply hose and try to pull a vacuum. If the vacuum pump can pull a vacuum, the hose is plugged. If the vacuum pump pulls a partial vacuum, the hose is restricted.  AM0953-A ● **Is the hose plugged or restricted?**	**Yes** INSTALL a new supply hose. TEST the system for normal operation. **No** RECONNECT the A/C damper door switch supply hose. GO to A15 .
A12 LEAK TEST THE JUMPER VACUUM HARNESS	
● Disconnect: ● Disconnect the suspect hose. ● Plug one end of the suspect hose and attach a vacuum pump to the other end. Apply 51 kPa (15 in-Hg) of vacuum to the hose.	**Yes** REPAIR or INSTALL a new vacuum jumper harness. TEST the

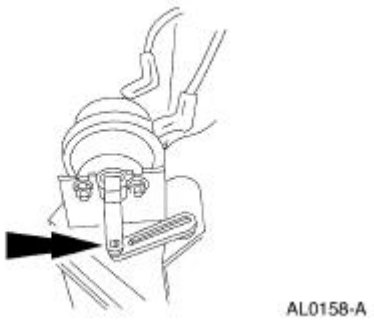
 AM0902-A ● **Does the vacuum drop?**	system for normal operation. **No** REPAIR or INSTALL a new function selector switch. TEST the system for normal operation.
A13 REVIEW THE VEHICLE'S HISTORY	
● Key in OFF position. ● Review the vehicles history. ● **Did the climate control system function correctly prior to this concern?**	**Yes** GO to A16 . **No** GO to A14 .
A14 CHECK THE VACUUM HOSES TO DAMPER DOORS	
● Connect a vacuum pump to each hose and try to pull a vacuum. If the vacuum pump can pull a vacuum, the hose is plugged. If the vacuum pump pulls a partial vacuum, the hose is restricted.  AM2197-A ● **Is a hose plugged or restricted?**	**Yes** INSTALL a new vacuum hose. TEST the system for normal operation. **No** GO to A15 .
A15 CHECK THE VACUUM HARNESS	
● Compare the vacuum hose color in each vacuum harness to the vacuum diagram. ● **Does the hose color agree with the schematics?**	**Yes** GO to A16 . **No** INSTALL a new vacuum harness. TEST the system for normal operation.
A16 CHECK A/C VACUUM CIRCUIT	
● Check the A/C vacuum circuit for pinched or kinked vacuum hose.	**Yes** REPAIR or INSTALL a new vacuum hose. TEST the system for normal operation. **No** GO to A17 .



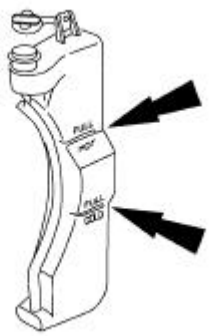
AM0351-B

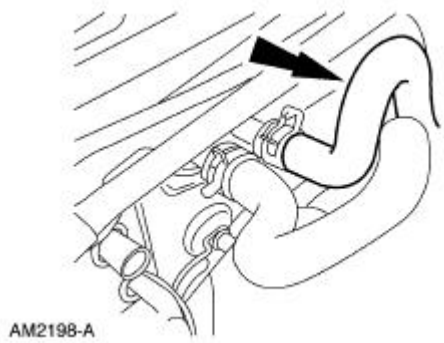
- **Is the hose pinched or kinked?**

A17 CHECK VACUUM CIRCUIT CONNECTIONS	
• Check each vacuum hose connection to determine if it is partially connected or disconnected.  GL0024-A • **Is a vacuum hose disconnected or partially connected?**	**Yes** RECONNECT the hose. TEST the system for normal operation. **No** GO to A18 .
A18 CHECK THE VACUUM HOSE	
• Disconnect the suspect hose. • Plug one end of the hose and attach a vacuum pump to the other end. Check for a leak in the hose.  AM0902-A • **Does the vacuum hose leak?**	**Yes** REPAIR or INSTALL a new hose. TEST the system for normal operation. **No** GO to A19 .
A19 CHECK THE VACUUM CONTROL MOTOR	
• Disconnect: Vacuum Control Motor. • Check the vacuum control motor for leaks with a vacuum pump.  AL0136-A	**Yes** GO to A20 . **No** INSTALL a new vacuum control motor. TEST the system for normal operation.

• **Does the vacuum control motor hold a vacuum?**	
A20 CHECK THE VACUUM CONTROL MOTOR INSTALLATION	
• Key in OFF position. • Check the attachment of the vacuum control motor arm to damper door.  AL0158-A • **Is the vacuum control motor arm attached to the door or door crank arm?**	**Yes** REPAIR or INSTALL a new damper door. TEST the system for normal operation. **No** CONNECT the vacuum control motor arm to the door and check operation. TEST the system for normal operation.

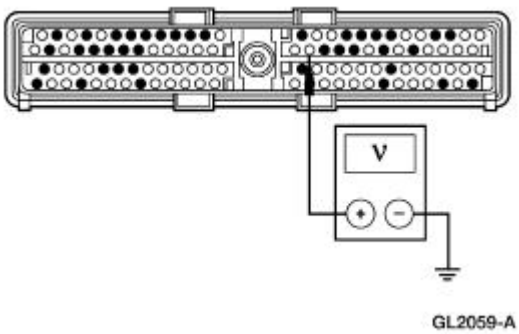
PINPOINT TEST B: INSUFFICIENT, ERRATIC, OR NO HEAT

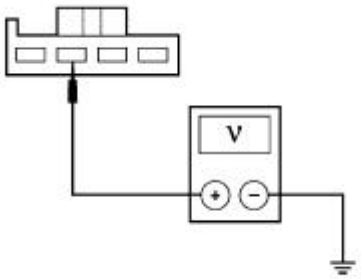
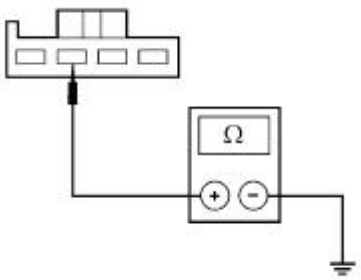
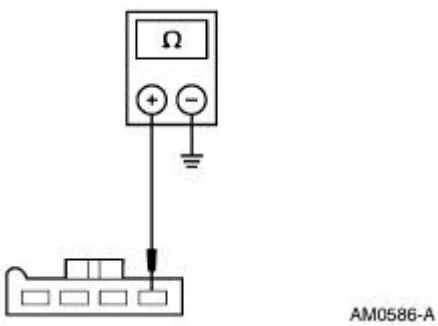
Test Step	Result / Action to Take
B1 CHECK FOR CORRECT ENGINE COOLANT LEVEL	
• Key in OFF position. • Check the engine coolant level when hot and cold.  AM2235-A • **Is the engine coolant at the correct level (hot/cold) as indicated on the engine coolant recovery reservoir?**	**Yes** GO to B2. **No** GO to B3.
B2 CHECK FOR HOT WATER TO THE HEATER CORE INLET HOSE	
WARNING: The heater core inlet hose will become too hot to handle and may cause serious burns if the system is working correctly. • Key in START position. • Allow the engine to reach normal operating temperature. • Feel the heater core inlet hose.	**Yes** GO to B4. **No** TEST the engine cooling system for correct operation. REFER to Section 303-03A or Section 303-03B.

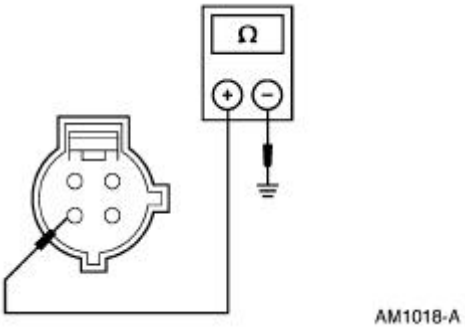
 AM2237-A ● **Is the heater core inlet hose too hot to handle?**	
B3 CHECK THE ENGINE COOLING SYSTEM INCLUDING RADIATOR CAP FOR LEAKS	
● Fill the engine cooling system to specified level. ● **NOTE:** It is not necessary to check the components separately at this time. ● Pressure check the engine cooling system. Refer to Section 303-03A or Section 303-03B . ● **Does the engine cooling system, including the radiator cap, hold pressure?**	**Yes** GO to B4 . **No** Pressure test the heater core. REFER to Component Tests, Heater Core — Pressure Test.
B4 CHECK THE HEATER CORE OUTLET HOSE FOR HOT WATER	
● Feel the heater core outlet hose.  AM2198-A ● **Is the heater core outlet hose cool or cold?**	**Yes** TEST the heater core for a plugged or partially plugged condition. REFER to Section 303-03A or Section 303-03B . **No** GO to Pinpoint Test E .

PINPOINT TEST C: THE A/C DOES NOT OPERATE/DOES NOT OPERATE CORRECTLY

Test Step	Result / Action to Take
C1 CHECK THE PCM PID WACF	
● Connect the diagnostic tool. ● Turn the function selector to the OFF position. ● Key in ON position. ● Enter the following diagnostic mode on the diagnostic tool: ● Monitor the PCM PID WACF while turning the function selector. ● **Does the PCM PID WACF read YES?**	**Yes** REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. **No** GO to C2 .
C2 CHECK THE PCM PID WACF WITH THE A/C ON	
● Turn the function selector switch to the A/C position. ● Enter the following diagnostic mode on the diagnostic	**Yes** REFER to the Powertrain

tool: ● Monitor the PCM PID WACF while turning the function selector. ● **Does the PCM PID WACF read YES?**	Control/Emissions Diagnosis (PC/ED) manual. **No** GO to C3.
C3 CHECK THE PCM PID ACCS WITH THE A/C ON ● Key in START position. ● Make sure the engine is at idle. ● Enter the following diagnostic mode on the diagnostic tool: PCM PID ACCS. ● Monitor the PCM PID ACCS while turning the function selector. ● **Does the PCM PID ACCS read ON?**	**Yes** GO to C4. **No** GO to C6.
C4 CHECK PCM PID WAC WITH THE A/C ON **NOTE:** When PCM PID WACF is YES, this is the same fault as DTC P1460. ● Enter the following diagnostic mode on the diagnostic tool: PCM PID WAC. ● Monitor the PCM PID WAC while turning the function selector. ● **Does the PCM PID WAC read ON?**	**Yes** GO to C20. **No** GO to C5.
C5 CHECK THE INPUT SIGNAL TO THE PCM ● Key in OFF position. ● Disconnect: PCM C175. ● Key in ON position. ● Measure the voltage at PCM C175-41, circuit 198 (DG/OG), harness side and ground.  GL2059-A ● **Is the voltage reading greater than 10 volts?**	**Yes** INSTALL a new powertrain control module. TEST the system for normal operation. **No** GO to C6.
C6 CHECK THE REFRIGERANT PRESSURE ● Key in OFF position. ● Connect the manifold gauge set. Refer to Refrigerant System Tests in this section. ● **Is the system pressure 345-1,724kPa (50-250psi)?**	**Yes** GO to C7. **No** REPAIR the leaks and RETEST the system for normal operation. REFER to Section 412-03.
C7 CHECK THE SUPPLY TO THE FUNCTION SELECTOR SWITCH ● Key in OFF position. ● Disconnect: Function Selector Switch C294c. ● Key in ON position. ● Measure the voltage at the function selector switch C294c-2, circuit 883 (PK/LB), harness side and ground.	**Yes** GO to C17. **No** GO to C8.

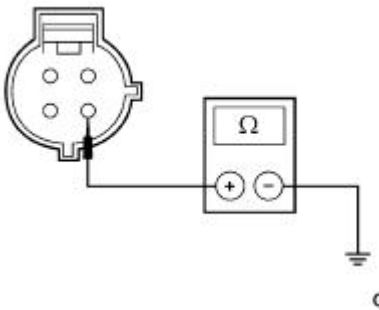
 GL2055-A ● **Is the voltage reading greater than 10 volts?**	
C8 CHECK CIRCUIT 883 (PK/LB) FOR A SHORT TO GROUND	
● Key in OFF position. ● Measure the resistance between the function selector switch C294c-2, circuit 883 (PK/ LB) harness side and ground.  GL2053-A ● **Is the resistance less than 5 ohms?**	**Yes** GO to C9 . **No** GO to C11 .
C9 CHECK CIRCUIT 348 (VT) FOR SHORT TO GROUND	
● Disconnect: A/C Cycling Switch C130. ● Measure the resistance between the function selector switch C294c-4, circuit 348 (VT) harness side and ground.  AM0586-A ● **Is the resistance reading less than 10,000 ohms?**	**Yes** REPAIR circuit 348 (VT). TEST the system for normal operation. **No** GO to C10 .
C10 CHECK FOR A SHORTED FUNCTION SELECTOR SWITCH	
● Connect: Function Selector Switch C294c. ● Measure the resistance between the A/C cycling switch C130-4, circuit 348 (VT) harness side and ground.	**Yes** INSTALL a new function selector switch. REFER to Section 412-04 . TEST the system for normal operation. **No** GO to C13 .



- Turn the function selector switch to each of the following positions and note the resistance reading:
  - MAX A/C
  - A/C
  - VENT
  - FLOOR
  - MIX
  - DEFROST
- **Are any of the readings less than 10,000 ohms?**

C11 CHECK CIRCUIT C198 (DG/OG) FOR A SHORT TO GROUND

- Connect: A/C Cycling Switch C130.
- Disconnect: A/C Pressure Cut-off Switch C1078.
- **NOTE:** The A/C pressure cut-off switch C1078 for the 3.8L engine is shown, C1078 for the 4.6L engines is similar. The pin locations and the circuits are identical.
- Measure the resistance between the A/C pressure cut-off switch C1078-3, circuit 198 (DG/OG), harness side and ground.



- **Is the resistance reading less than 10,000 ohms?**

Yes
GO to C14 .

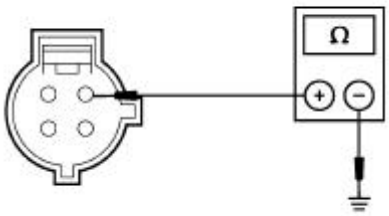
No
GO to C12 .

C12 CHECK THE A/C CYCLING SWITCH FOR A SHORT TO GROUND

- Disconnect: A/C Cycling Switch C130.
- **NOTE:** The A/C pressure cut-off switch C1078 for the 3.8L engine is shown, C1078 for the 4.6L engines is similar. The pin locations and the circuits are identical.
- Measure the resistance between the A/C pressure cut-off switch C1078-2, circuit 420 (DB/YE), harness side and ground.

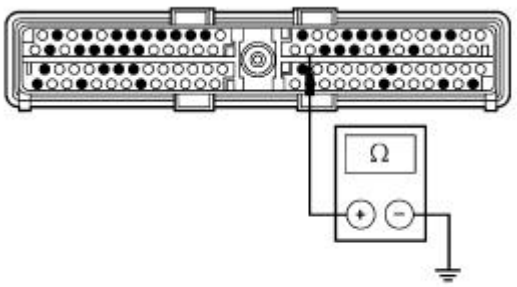
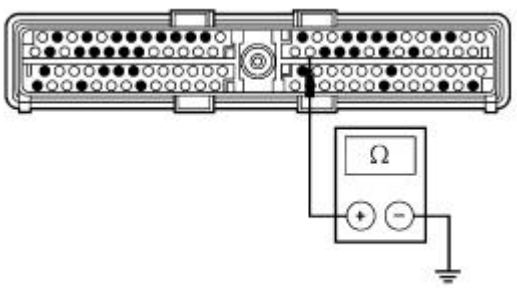
Yes
REPAIR circuit C420 (DB/YE) for a short to ground. TEST for normal operation.

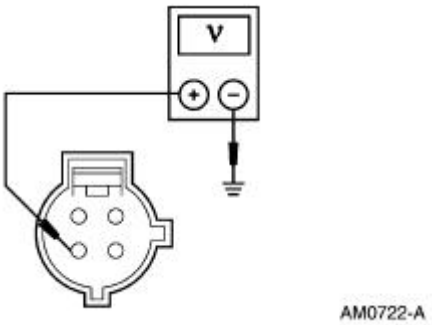
No
INSTALL a new A/C cycling switch. REFER to Section 412-03 . TEST system for normal operation.



AM2248-A

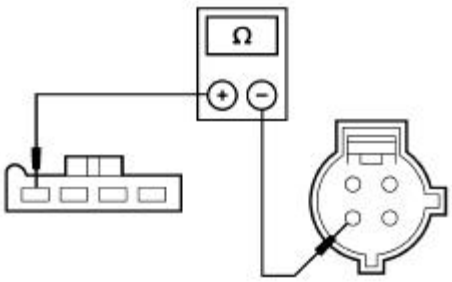
- **Is the resistance reading less than 10,000 ohms?**

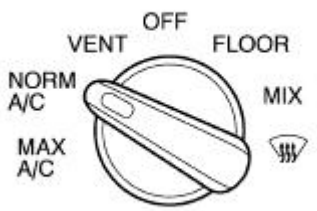
C13 CHECK CIRCUIT 198 (DG/OG) FOR A SHORT TO GROUND	
• Connect: A/C Pressure Cut-off Switch C1078. • Measure the resistance between PCM C175-41, circuit 198 (DG/OG), harness side and ground.  GL2058-A • **Is the resistance less than 10,000 ohms?**	**Yes** GO to C15 . **No** INSTALL a new A/C fuse (15A). TEST the system for normal operation. If the fuse opens, install a new PCM. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
C14 CHECK THE A/C PRESSURE CUT-OFF SWITCH	
• Disconnect: A/C Pressure Cut-off Switch C1078. • Measure the resistance between the Rotunda EEC-V Breakout Box pin 41, circuit 198 (DG/OG), and ground.  GL2058-A • **Is the resistance less than 10,000 ohms?**	**Yes** REPAIR circuit 198 (DG/OG) for a short to ground. TEST the system for normal operation. **No** INSTALL a new A/C pressure cut-off switch. REFER to Section 412-03 .
C15 CHECK THE FUNCTION SELECTOR SWITCH	
• Key in OFF position. • Connect: Function Selector Switch C294c. • Disconnect: A/C Cycling Switch C130. • Key in ON position. • Turn the function selector switch to the A/C position. • Measure the voltage between C130-4, circuit 348 (VT), harness side and ground.	**Yes** GO to C17 . **No** GO to C16 .

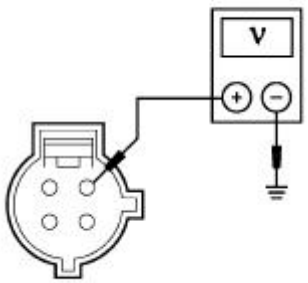
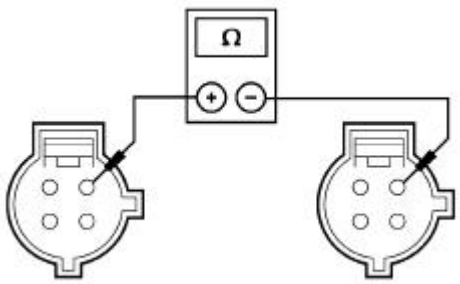
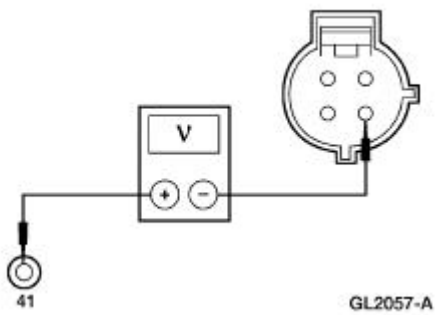


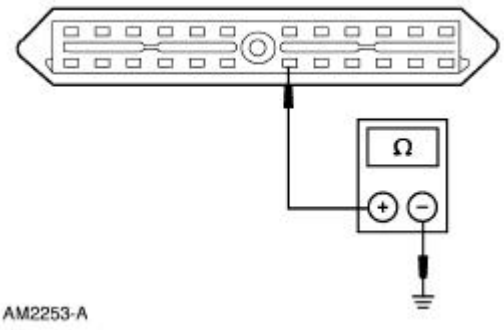
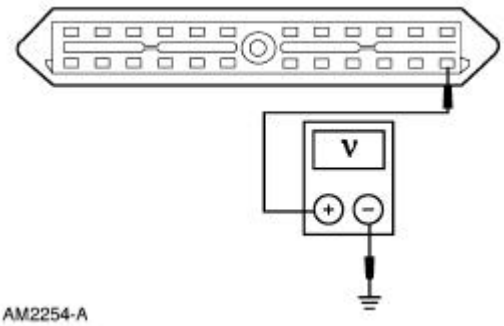
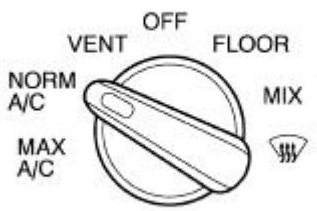
AM0722-A

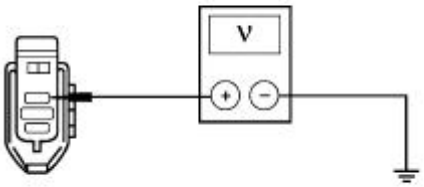
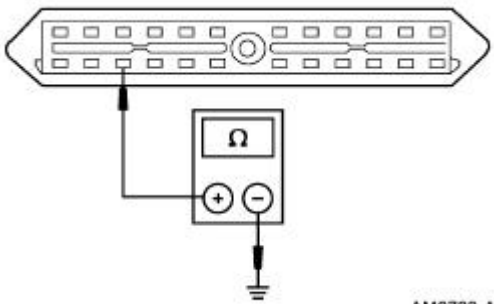
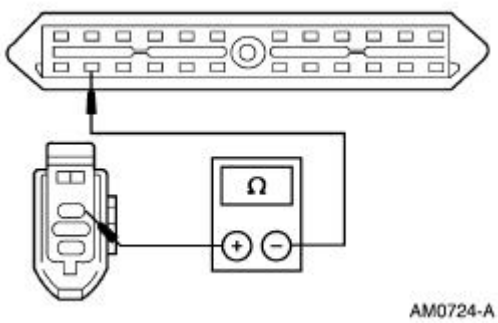
- **Is the voltage reading greater than 10 volts?**

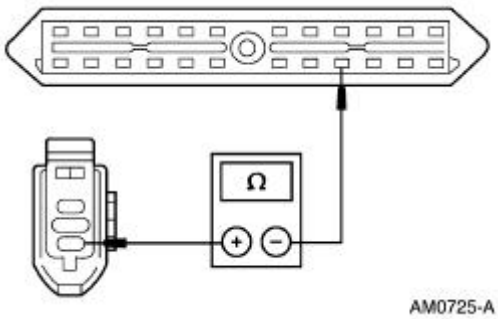
C16 MEASURE THE RESISTANCE OF CIRCUIT 348 (VT)	
• Key in OFF position. • Disconnect: Function Selector Switch C294c. • Measure the resistance between the A/C function selector switch C294c-1, circuit 348 (VT), harness side and A/C cycling switch C130-4, circuit 348 (VT), harness side.  AM2249-A • **Is the resistance reading less than 5 ohms?**	**Yes** INSTALL a new function selector switch. REFER to Section 412-04 . TEST the system for normal operation. **No** REPAIR circuit 348 (VT) for an open. TEST the system for normal operation.

C17 MEASURE THE VOLTAGE TO THE A/C PRESSURE CUT-OFF SWITCH	
• Key in OFF position. • Connect: A/C Cycling Switch C130. • Disconnect: A/C Pressure Cut-off Switch C1078. • Turn the function selector switch to the A/C position.  AM1452-A • **NOTE:** The A/C pressure cut-off switch C1078 for the 3.8L engine is shown, C1078 for the 4.6L engines is similar. The pin locations and the circuits are identical. • Measure the voltage at the A/C high pressure cut-off switch C1078-2 circuit 420 (DB/YE), harness side and ground.	**Yes** GO to C19 . **No** GO to C18 .

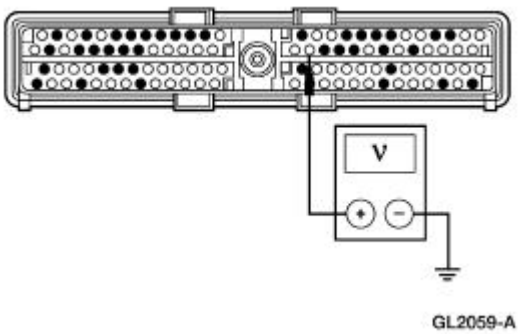
 AM2250-A ● **Is the voltage reading greater than 10 volts?**	
C18 CHECK THE A/C CYCLING SWITCH ● Key in OFF position. ● Disconnect: A/C Cycling Switch C130. ● **NOTE:** The A/C pressure cut-off switch C1078 for the 3.8L engine is shown, C1078 for the 4.6L engines is similar. The pin locations and the circuits are identical. ● Measure the resistance between A/C cycling switch C130-2, circuit 420 (DB/YE), harness side and the A/C high pressure cut-off switch C1078-2, circuit 420 (DB/YE), harness side.  AM2251-A ● **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new A/C cycling switch. REFER to Section 412-03 . TEST the system for normal operation. **No** REPAIR circuit 420 (DB/YE) for an open. TEST the system for normal operation.
C19 CHECK THE A/C PRESSURE CUT-OFF SWITCH ● Key in OFF position. ● **NOTE:** The A/C pressure cut-off switch C1078 for the 3.8L engine is shown, C1078 for the 4.6L engines is similar. The pin locations and the circuits are identical. ● Measure the resistance between Rotunda Breakout Box pin 41 and A/C high pressure cut-off switch C1078-3, circuit 198 (DG/OG), harness side.  41 GL2057-A ● **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new A/C pressure cut-off switch. REFER to Section 412-03 . TEST the system for normal operation. **No** REPAIR circuit 198 (DG/OG) for an open. TEST the system for normal operation.
C20 CHECK THE GROUND CIRCUIT AT THE CONSTANT CONTROL RELAY MODULE ● Key in OFF position.	**Yes**

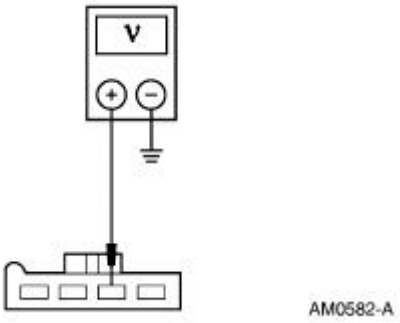
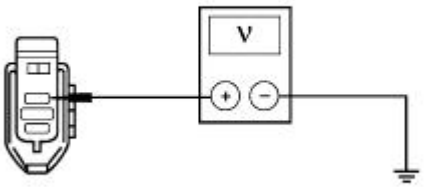
• Disconnect: CCRM C1262. • Measure the resistance of CCRM C1262-18, circuit 1205 (BK), harness side and ground.  AM2253-A • **Is the resistance reading less than 5 ohms?**	GO to C21 . **No** REPAIR circuit 1205 (BK) for an open. TEST the system for normal operation.
C21 CHECK CIRCUIT 20 (WH/LB) AT THE CONSTANT CONTROL RELAY MODULE	
• Key in ON position. • Measure the voltage at the CCRM C1262-13, circuit 20 (WH/LB), harness side and ground.  AM2254-A • **Is the voltage reading greater than 10 volts?**	**Yes** GO to C22 . **No** REPAIR circuit 20 (WH/LB) for an open. TEST the system for normal operation.
C22 CHECK THE POWER TO THE A/C CLUTCH	
• Key in OFF position. • Connect: CCRM 1262. • Disconnect: A/C Clutch C100. • Turn the function selector to the A/C position.  AM1452-A • Measure the voltage at the A/C clutch C100, circuit 347 (BK/YE), harness side and ground.	**Yes** GO to C24 . **No** GO to C23 .

 GL0225-A ● **Is the voltage greater than 10 volts?**	
C23 CHECK CIRCUIT 331 (PK/YE) FOR AN OPEN. ● Key in OFF position. ● Disconnect: CCRM C1262. ● Key in ON position. ● Enter the following diagnostic mode on the diagnostic tool: ● In the Active Command Mode command the PCM outputs ON. ● Measure the resistance between the CCRM C1262-22, circuit 331 (PK/YE), harness side and ground.  AM0733-A ● **Is the resistance reading less than 5 ohms?**	**Yes** GO to C24 . **No** REPAIR circuit 331 (PK/YE) for an open. TEST the system for normal operation.
C24 CHECK CIRCUIT 347 (BK/YE) ● Key in OFF position. ● Measure the resistance between CCRM C1262-23, circuit 347 (BK/YE), harness side and A/C clutch C100-1, harness side.  AM0724-A ● **Is the resistance less than 5 ohms?**	**Yes** GO to C25 . **No** REPAIR circuit 347 (BK/YE) for an open. TEST the system for normal operation.
C25 CHECK CIRCUIT 347 (BK/YE) FOR A SHORT TO GROUND. ● Measure the resistance between A/C clutch C100-2, circuit 1205 (BK), harness side and the CCRM C1262-16, circuit 1205 (BK) harness side.	**Yes** INSTALL a new constant control relay module. TEST the system for normal operation.

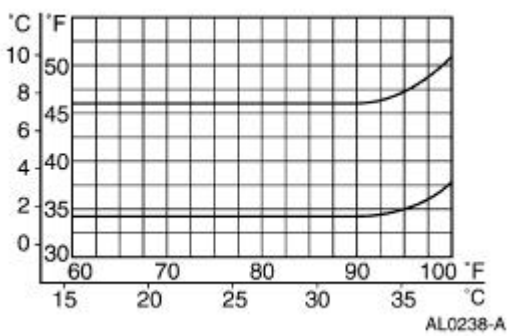
 ● **Is the resistance less than 5 ohms?**	**No** REPAIR circuit 1205 (BK) for an open. TEST the system for normal operation.

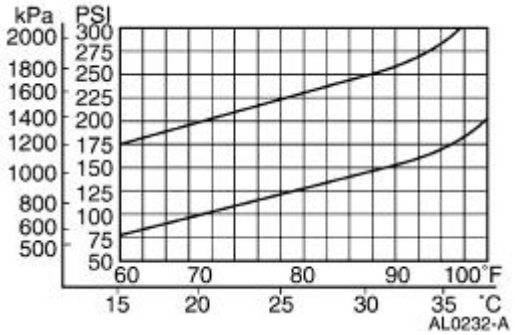
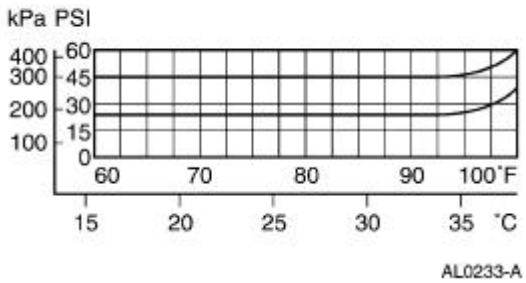
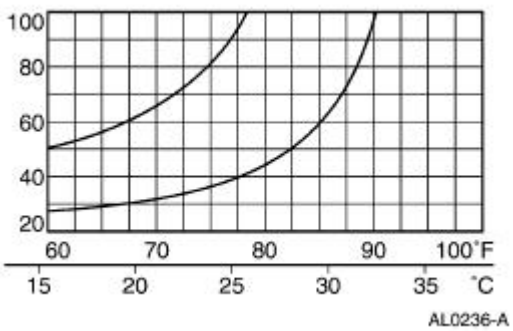
PINPOINT TEST D: THE A/C IS ALWAYS ON

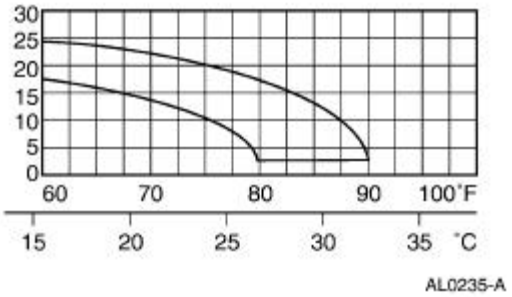
Test Step	Result / Action to Take
D1 CHECK PCM PID WACF	
● Turn the function selector switch to the OFF position. ● Key in ON position. ● Enter the following diagnostic mode on the diagnostic tool: PCM PID WACF. ● **Does the PCM PID WACF read YES?**	**Yes** REPAIR circuit 331 (PK/YE) for a short to ground. TEST the system for normal operation. **No** GO to D2 .
D2 CHECK PID ACCS WITH A/C OFF	
● Enter the following diagnostic mode on the diagnostic tool: PCM PID ACCS. ● **Does the PCM PID ACCS read ON?**	**Yes** GO to D3 . **No** GO to D5 .
D3 CHECK FOR A FALSE INPUT SIGNAL TO THE PCM	
● Key in OFF position. ● Disconnect: PCM C175. ● Key in ON position. ● Turn the function selector switch to the OFF position. ● Measure the voltage between PCM C175-41, circuit 198 (DG/OG) harness side and ground.  ● **Is the voltage greater than 10 volts?**	**Yes** GO to D4 . **No** INSTALL a new powertrain control module. REFER to Section 303-14 . TEST the system for normal operation.
D4 CHECK CIRCUIT 198 (DG/OG) FOR A SHORT TO B+	
● Key in OFF position. ● Disconnect: Function Selector Switch C294c. ● Connect: PCM C175. ● Key in ON position. ● Measure the voltage at the function selector switch	**Yes** REPAIR circuit 348 (PK) for a short to B+. TEST the system for normal operation.

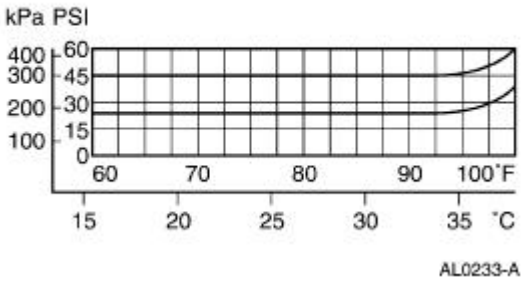
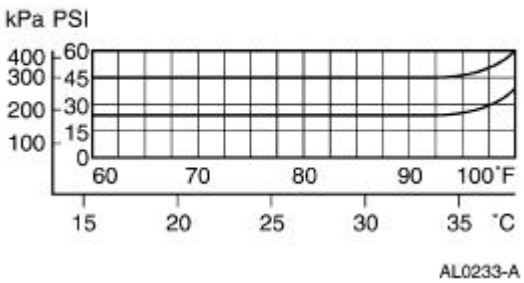
C294c-3, circuit 348 (PK), harness side and ground.  AM0582-A ● **Is there voltage present?**	**No** INSTALL a new function selector switch. REFER to Section 412-04 . TEST the system for normal operation.
D5 CHECK FOR A SHORTED CLUTCH INPUT	
● Key in OFF position. ● Disconnect: A/C Clutch C100. ● Key in ON position. ● Measure for voltage at the A/C clutch C100, circuit 347 (BK/YE), harness side and ground.  GL0225-A ● **Is there voltage present?**	**Yes** INSTALL a new constant control relay module. TEST the system for normal operation. **No** CHECK the clutch air gap. REFER to Air Conditioning (A/C) Clutch Air Gap Adjustment .

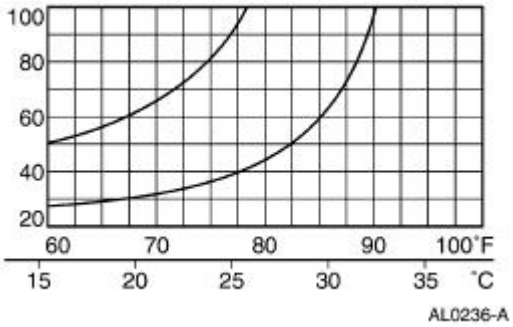
PINPOINT TEST E: INSUFFICIENT A/C COOLING

Test Step	Result / Action to Take
E1 CHECK THE CENTER A/C REGISTER DISCHARGE TEMPERATURE	
● Carry out the refrigerant system tests. Refer to Refrigerant System Tests in this section. ● Use the recorded data from the refrigerant system tests to plot a vertical line for ambient temperature and a horizontal line for center A/C register discharge temperature.  AL0238-A ● **Is the intersection of the two lines within the upper and lower limits?**	**Yes** The tests indicate that the system is functioning normally. **No** GO to E2 .

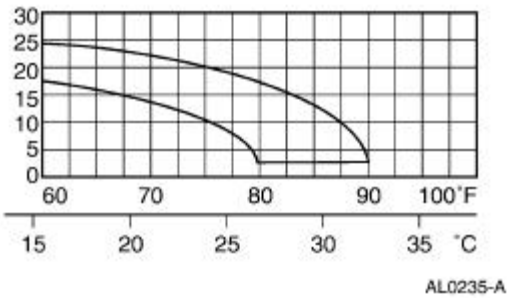
E2 CHECK FOR NORMAL DISCHARGE PRESSURE	
• Use the recorded data from the refrigerant system tests to plot a vertical line for ambient temperature and a horizontal line for compressor discharge (high) pressure.  • **Is the intersection of the two lines within the upper and lower limits?**	**Yes** GO to E3 . **No** GO to E8 .
E3 EVALUATE THE SYSTEM LOW PRESSURE PERFORMANCE	
• Use the recorded data from the refrigerant system tests to plot a vertical line for ambient temperature and a horizontal line for compressor suction (low) pressure.  • **Is the intersection of the two lines within the upper and lower limits?**	**Yes** GO to E4 . **No** GO to E6 .
E4 CHECK FOR A SLOW OR CONTINUOUS RUN A/C CLUTCH CYCLE RATE	
• Use the recorded data from the refrigerant system tests to plot a vertical line for ambient temperature and a horizontal line for total A/C clutch cycle time (time ON plus time OFF) in seconds.  • **Is the intersection of the two lines above the upper limit?**	**Yes** GO to E5 . **No** INSTALL a new A/C evaporator core due to a partially restricted or plugged condition. REFER to Section 412-02 . TEST the system for normal operation.
E5 CHECK FOR A LONG OR CONTINUOUS A/C CLUTCH OFF TIME	
• Use the recorded data from the refrigerant system tests	**Yes**

to plot a vertical line for ambient temperature and a horizontal line for A/C clutch OFF time in seconds.  AL0235-A ● **Is the intersection of the two lines above the upper limit?**	DISCHARGE and RECOVER the system to remove excessive moisture or refrigerant oil. REFER to Air Conditioning (A/C) System Recovery, Evacuation and Charging . TEST the system for normal operation. **No** GO to E7 .
E6 CHECK FOR A HIGH SUCTION PRESSURE	
● Refer to the data plot used to evaluate the system low pressure performance in Step E3. ● **Is the intersection of the two lines above the upper limit?**	**Yes** REMOVE the A/C evaporator core orifice to repair missing or damaged (leaking) O-ring seals. REFER to Section 412-03 . TEST the system for normal operation. **No** INSTALL a new A/C cycling switch when the intersection of the two lines is below the lower limit. REFER to Section 412-03 . TEST the system for normal operation.
E7 CHECK THE AMBIENT TEMPERATURE	
● Refer to the data plot used to evaluate the system A/C clutch OFF time in Step E5. ● **Is the ambient temperature above 26°C (80°F)?**	**Yes** This is normal operation for the refrigerant system in high humidity conditions. **No** DISCHARGE and RECOVER the system to correct an overcharge condition. REFER to Air Conditioning (A/C) System Recovery, Evacuation and Charging . TEST the system for normal operation.
E8 CHECK FOR A HIGH DISCHARGE PRESSURE	
● Refer to the data plot used to evaluate the system high pressure performance in Step E2. ● **Is the intersection of the two lines above the upper limit?**	**Yes** GO to E9 . **No** GO to E11 .
E9 CHECK FOR A NORMAL LOW PRESSURE	
● Use the recorded data from the refrigerant system tests to plot a vertical line for ambient temperature and a horizontal line for compressor suction (low) pressure.	**Yes** REFER to Section 303-03A or Section 303-03B . to diagnose the engine cooling system. TEST the system for normal operation.

 ● **Is the intersection of the two lines within the upper and lower limits?**	**No** GO to E10 .
E10 CHECK FOR A NORMAL TO LOW SUCTION PRESSURE	
● Refer to the data plot used to evaluate the system low pressure performance in Step E9. ● **Is the intersection of the two lines below the lower limit?**	**Yes** INSTALL a new A/C evaporator core orifice due to a partially restricted or plugged condition. REFER to Section 412-03 . TEST the system for normal operation. **No** INSPECT the A/C condenser core (19712) for a partially blocked or inadequate airflow. TEST the system for normal operation.
E11 CHECK FOR A NORMAL SUCTION PRESSURE	
● Use the recorded data from the refrigerant system tests to plot a vertical line for ambient temperature and a horizontal line for compressor suction (low) pressure.  ● **Is the intersection of the two lines within the upper and lower limits?**	**Yes** GO to E12 . **No** GO to E15 .
E12 CHECK FOR A SLOW A/C CLUTCH CYCLE RATE	
● Use the recorded data from the refrigerant system tests to plot a vertical line for ambient temperature and a horizontal line for total A/C clutch cycle time (time ON plus time OFF) in seconds.	**Yes** INSTALL a new evaporator to compressor suction line (19D742) due to a partially restricted or plugged condition. REFER to Section 412-03 . TEST the system for normal operation. **No** GO to E13 .

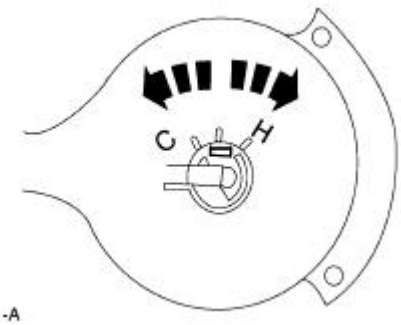


- **Is the intersection of the two lines above the upper limit?**

E13 CHECK FOR A NORMAL A/C CLUTCH OFF TIME	
• Use the recorded data from the refrigerant system tests to plot a vertical line for ambient temperature and a horizontal line for A/C clutch OFF time in seconds.  • **Is the intersection of the two lines within the upper and lower limits?**	**Yes** INSPECT the A/C evaporator core due to a low or restricted airflow. TEST the system for normal operation. **No** GO to E14 .
E14 CHECK FOR A LONG A/C CLUTCH OFF TIME	
• Refer to the data plot used to evaluate the system A/C clutch OFF time performance in Step E13. • **Is the intersection of the two lines above the upper limit?**	**Yes** INSTALL a new A/C condenser core due to a partially restricted or plugged condition. REFER to Section 412-03 . TEST the system for normal operation. **No** EVACUATE and RECHARGE the system when the intersection of the two lines is below the lower limit. REFER to Air Conditioning (A/C) System Recovery, Evacuation and Charging . TEST the system for normal operation.
E15 CHECK FOR A MISSING A/C EVAPORATOR CORE ORIFICE	
• Remove the A/C evaporator core orifice tube. Refer to Section 412-03 . • **Is the A/C evaporator core orifice missing?**	**Yes** INSTALL a new A/C evaporator core orifice. REFER to Section 412-03 . TEST the system for normal operation. **No**

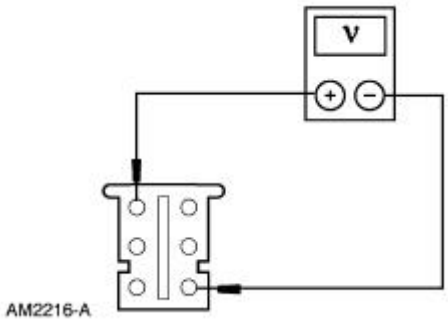
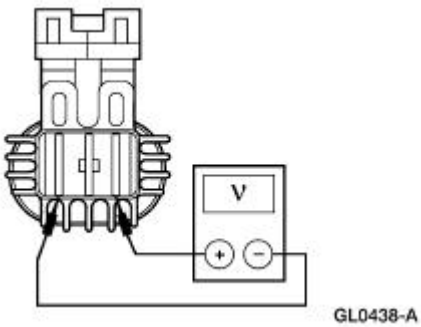
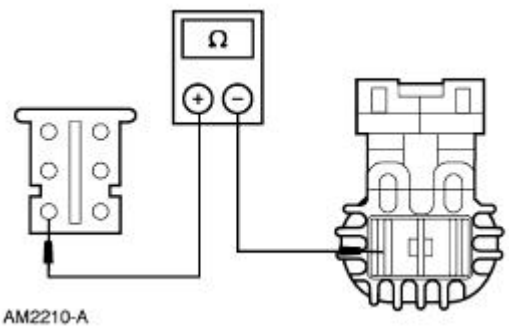
	INSTALL a new A/C compressor due to low performance. REFER to Section 412-03 . TEST the system for normal operation.

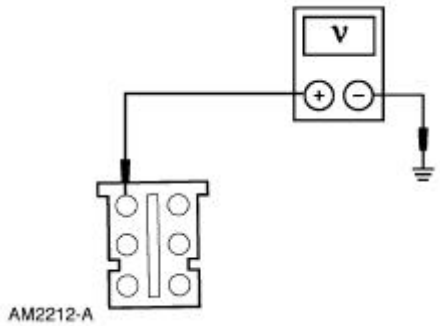
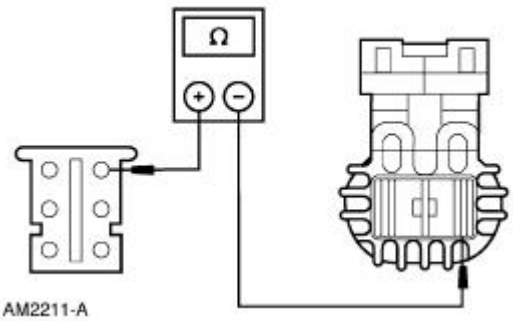
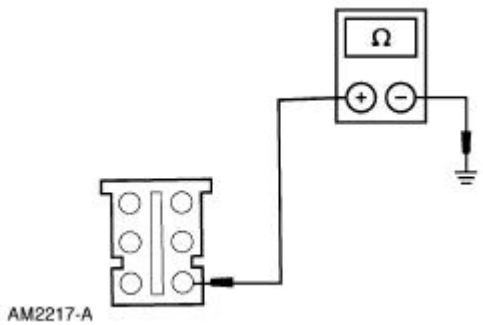
PINPOINT TEST F: NO OPERATION IN ALL TEMPERATURE SETTINGS

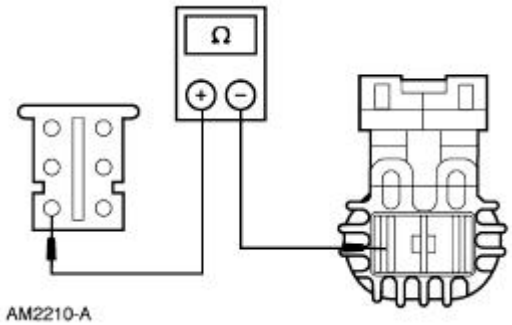
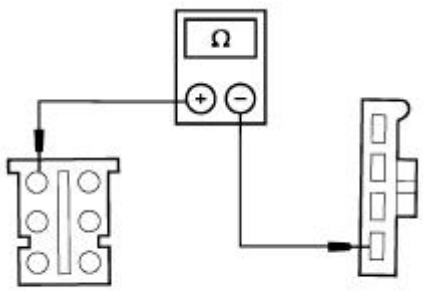
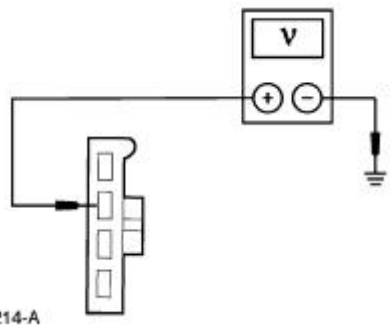
Test Step	Result / Action to Take
F1 CHECK THE TEMPERATURE CONTROL	
• Start the engine and run at idle. Allow the engine to reach normal operating temperature. • Place the function selector switch in the NORMAL A/C position. • Adjust the temperature control to full warm position, and physically feel the discharge air temperature at the at the center panel vents. • Rotate the temperature control to full cold position, and physically feel the discharge air temperature at the center panel vents. • **Does the discharge air temperature vary?**	**Yes** The temperature blend door is functioning correctly. RETURN to the symptom chart. **No** GO to F2 .
F2 CHECK FOR A BROKEN A/C TEMPERATURE CONTROL CABLE	
• Remove the climate control assembly to gain access to the control cable head. • Move the temperature control from full warm to full cold. • Inspect the cable control head as you move the temperature control.  AM2141-A • **Does the alignment mark on the control head move?**	**Yes** INSTALL a new evaporator housing. REFER to Section 412-02 . **No** INSTALL a new temperature control cable assembly. REFER to Section 412-04 .

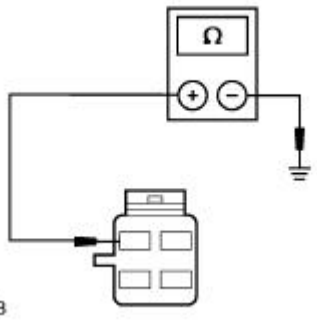
PINPOINT TEST G: THE BLOWER MOTOR DOES NOT OPERATE/DOES NOT OPERATE CORRECTLY

Test Step	Result / Action to Take
G1 CHECK FOR VOLTAGE AT C238	
• Disconnect: Blower Motor Jumper C238. • Key in ON position. • Turn the blower motor selector to LOW. • Turn the function selector to FLOOR. • Check for voltage between C238-6, circuit 249 (DB/LG) and C238-3, circuit 261 (OG/BK).	**Yes** GO to G2 . **No** GO to G4 .

 AM2216-A ● **Is the voltage greater than 10 volts?**	
G2 CHECK THE BLOWER MOTOR FOR VOLTAGE ● Key in OFF position. ● Connect: Blower Motor Jumper C238. ● Disconnect: Blower Motor C2066. ● Key in ON position. ● Measure voltage between terminals of blower motor.  GL0438-A ● Check for voltage between circuit 249 (DB/LG) and circuit 261 (OG/BK). ● **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new blower motor. REFER to Section 412-02 . TEST the system for normal operation. **No** GO to G3 .
G3 CHECK THE A/C BLOWER MOTOR JUMPER WIRE ● Key in OFF position. ● Disconnect: Blower Motor Jumper C238. ● Key in ON position. ● Check circuit 261 (OG/BK) for an open between C2066 and C238-4.  AM2210-A ● **Is the resistance greater than 5 ohms?**	**Yes** REPAIR circuit 261 (OG/BK). TEST the system for normal operation. **No** INSTALL a new blower motor. REFER to Section 412-02 . TEST the system for normal operation.
G4 CHECK CIRCUIT 249 (DB/LG) ● Check for voltage between C238-6, circuit 249 (DB/LG), harness side and ground.	**Yes** GO to G5 . **No** GO to G8 .

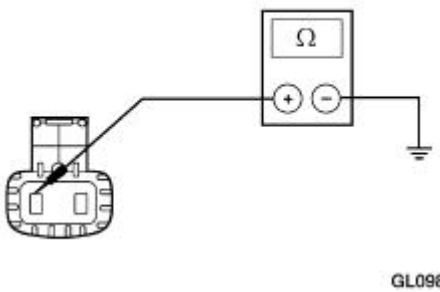
 AM2212-A ● **Is the voltage greater than 10 volts?**	
G5 CHECK CIRCUIT 249 (DB/LG) FOR OPEN	
● Check the resistance on circuit 249 (DB/LG) between C238-3 and C2066.  AM2211-A ● **Is resistance less than 10,000 ohms?**	**Yes** REPAIR circuit 249 (DB/LG) for an open. TEST the system for normal operation. **No** GO to G6.
G6 CHECK THE BLOWER MOTOR GROUND	
● Key in OFF position. ● Measure the resistance between the jumper C238-3, circuit 261 (OG/BK), and ground.  AM2217-A ● **Is the resistance less than 5 ohms?**	**Yes** GO to G7. **No** GO to G10.
G7 CHECK CIRCUIT 261 (OG/BK) FOR AN OPEN CIRCUIT	
● Measure the resistance between the A/C blower motor jumper C238-3, circuit 261 (OG/BK) and the blower motor switch C294a-1.	**Yes** REPAIR the blower motor jumper. TEST the system for normal operation. **No** INSTALL a new blower motor. REFER to Section 412-02. TEST the system for normal operation.

 AM2210-A ● **Is the resistance more than 10,000 ohms?**	
G8 CHECK CIRCUIT 249 (DB/LG) FOR AN OPEN CIRCUIT	
● Key in OFF position. ● Disconnect: Function Selector Switch C294c. ● Measure the resistance between C238-3, circuit 249 (DB/LG), harness side and C294c-4 harness side.  AM2213-A ● **Is the resistance more than 10,000 ohms?**	**Yes** REPAIR circuit 249 (DB/LG) for an open. TEST the system for normal operation. **No** GO to G9 .
G9 CHECK CIRCUIT 181 (BN/OG), FOR VOLTAGE	
● Measure the voltage between C294c-2, circuit 181 (BN/OG), harness side and ground.  AM2214-A ● **Is the voltage greater than 10 volts?**	**Yes** INSTALL a new function selector switch. REFER to Section 412-04 . TEST the system for normal operation. **No** REPAIR circuit 181 (BN/OG) for an open. TEST the system for normal operation.
G10 CHECK CIRCUIT 1205 (BK) FOR AN OPEN	
	Yes INSTALL a new blower motor switch. REFER to Section 412-04 . TEST the system for normal operation. **No** REPAIR circuit 1205 (BK). TEST the system for normal operation.

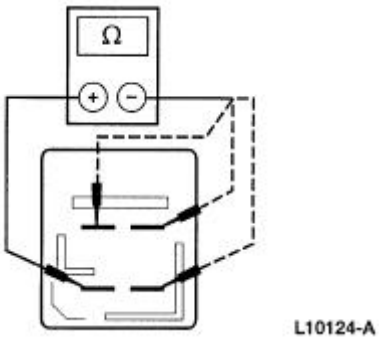


- Check the resistance between C294a-3, circuit 1205 (B/K) harness side and ground.
- **Is the resistance less than 5 ohms?**

PINPOINT TEST H: THE BLOWER MOTOR OPERATES CONTINUOUSLY IN HIGH SPEED

Test Step	Result / Action to Take
H1 CHECK THE FUNCTION SELECTOR SWITCH • Key in ON position. • Set the blower motor speed to low. • Check for blower motor operation in each function selector switch position. • **Does the blower motor operate on high in all of the function selector positions?**	**Yes** GO to H2 . **No** If the blower motor operates in the OFF position, GO to H4 .
H2 CHECK CIRCUIT 261 (OG/BK) FOR A SHORT TO GROUND • Key in OFF position. • Disconnect: A/C Blower Motor C2066. • Disconnect: Blower Motor Resistor C2185. • Disconnect: Blower Motor Switch C294a. • Measure the resistance between C2066 circuit 261 (OG/BK), and ground.  • **Is the resistance greater than 10,000 ohms?**	**Yes** GO to H3 . **No** REPAIR circuit 261 (OG/BK) for a short to ground. TEST the system for normal operation.
H3 CHECK THE BLOWER MOTOR SWITCH OPERATION • Measure the resistance of the blower motor switch. Refer to the chart shown. **Blower Motor Switch Test** **Switch Position** / **Conductivity Between Terminals**	**Yes** INSTALL a new heater blower motor switch resistor. REFER to Section 412-04 . TEST the system for normal operation. **No**

Low	None
Medium/low	2 and 3 only
Medium/high	2, 3 and 4 only
High	1, 2 and 4 only



- **Is the resistance less than 5 ohms?**

INSTALL a new heater blower motor switch. REFER to Section 412-04 . TEST the system for normal operation.

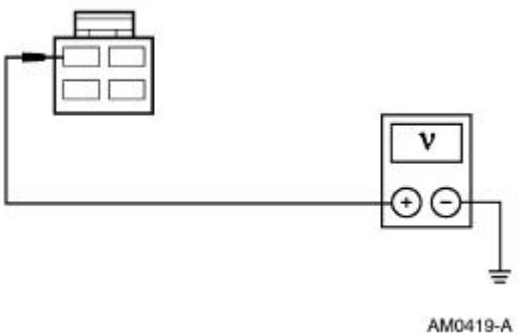
H4 CHECK THE FUNCTION SELECT SWITCH FOR A SHORT TO BATTERY

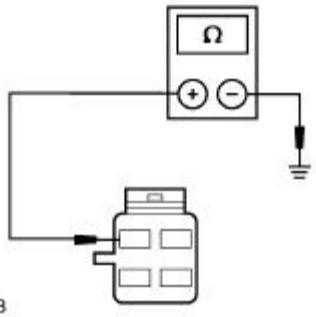
- Key in OFF position.
- Disconnect: Function Selector Switch C294c.
- Key in ON position.
- **Did the blower motor stop operating?**

Yes
INSTALL a new function selector switch. REFER to Section 412-04 . TEST the system for normal operation.

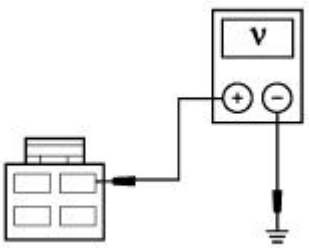
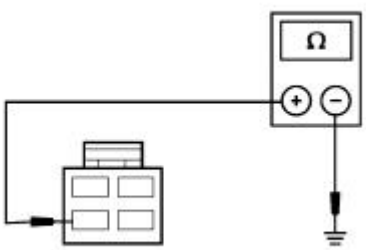
No
REPAIR circuit 249 (DB/LG) for a short to battery. TEST the system for normal operation.

PINPOINT TEST I: NO OPERATION IN HIGH BLOWER SETTING

Test Step	Result / Action to Take
I1 CHECK CIRCUIT 261 (OG/BK) FOR AN OPEN CIRCUIT	
• Key in OFF position. • Disconnect: Blower Motor Switch C294a. • Key in ON position. • Turn the function selector switch to the FLOOR position. • Measure the voltage between blower motor switch C294a, circuit 261 (OG/BK), harness side and ground.  • **Is the voltage greater than 10 volts?**	**Yes** GO to I2 . **No** REPAIR circuit 261 (OG/BK) for an open circuit. TEST the system for normal operation.
I2 CHECK CIRCUIT 1205 (BK) FOR AN OPEN	

• Measure the resistance between C294a-3, circuit 1205 (BK), harness side and ground.  AM2215-B • **Is the resistance less than 10,000 ohms?**	**Yes** REPAIR circuit 1205 (BK) for an open. TEST the system for normal operation. **No** INSTALL a new blower motor switch. REFER to Section 412-04 . TEST the system for normal operation.

PINPOINT TEST J: NO OPERATION IN LOWER SPEEDS

Test Step	Result / Action to Take
J1 CHECK CIRCUIT 261 (OG/BK) FOR AN OPEN	
• Disconnect: Blower Motor Resistor C294a. • Key in ON position. • Turn the function selector switch to the FLOOR position. • Set the blower motor switch to low. • Measure the voltage between the blower motor resistor C2185-4, circuit 261 (OG/BK), jumper side and ground.  AM2225-A • **Is the voltage greater than 10 volts?**	**Yes** GO to J2 . **No** REPAIR circuit 261 (OG/BK) for an open circuit between the blower motor and the blower motor resistor. TEST the system for normal operation.
J2 CHECK CIRCUIT 1205 (BK) FOR AN OPEN	
• Key in OFF position. • Measure the resistance between the blower motor resistor C2185-1, circuit 1205 (BK), jumper side and ground.  AM2224-A • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new blower motor resistor. REFER to Section 412-03 . TEST the system for normal operation. **No** REPAIR circuit 1205 (BK) for an open between the blower motor resistor and ground. TEST the system for normal operation.

Component Tests

Heater Core

WARNING: Carbon monoxide gas is colorless, odorless and dangerous. If it is necessary to operate the engine with the vehicle in a closed area such as a garage, always use an exhaust collector to vent the exhaust gases outside the closed area. Failure to follow these instructions may result in personal injury.

1. **NOTE:** Testing of returned heater cores reveals that a large percentage of heater cores are good and did not require installation of a new heater core. If a heater core leak is suspected, the heater core must be tested by following the Plugged Heater Core Component Test before the Heater Core Pressure Test. Carry out a system inspection by checking the heater system thoroughly as follows:

   Inspect for evidence of coolant leakage at the heater water hose to heater core attachments. A coolant leak in the heater water hose could follow the heater core tube to the heater core and appear as a leak in the heater core.

CAUTION: Spring-type clamps are installed as original equipment. Installation and overtightening of non-specification clamps can cause leakage at the heater water hose connection and damage the heater core.

2. Check the integrity of the heater water hose clamps.

Heater Core—Plugged

WARNING: The heater core inlet hose will become too hot to handle if the system is working correctly.

1. Check to see that the engine coolant is at the correct level.
2. Start the engine and turn on the heater.
3. When the engine coolant reaches operating temperature, feel the heater core outlet hose to see if it is hot.
   If it is not hot:
   - the heater core may have an air pocket.
   - the heater core may be plugged.
   - the thermostat is not working correctly.

Heater Core—Pressure Test

Use the radiator/heater core pressure tester to carry out the pressure test.

1. **NOTE:** Due to space limitations, a bench test may be necessary for pressure testing.

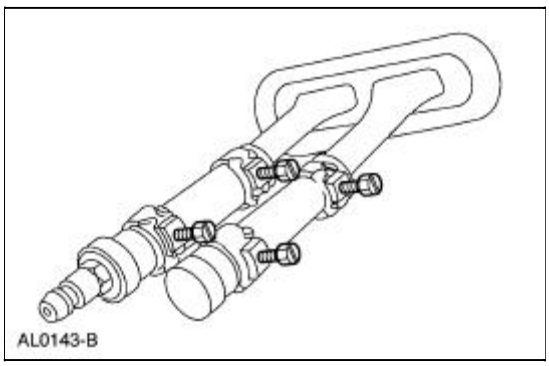
   Drain the coolant from the cooling system. For additional information, refer to Section 303-03A or Section 303-03B .

2. Disconnect the heater water hoses from the heater core. For additional information, refer to

Section 412-02 .

3. Install a short piece of heater water hose, approximately 101 mm (4 inches) long on each heater core tube.

4. Fill the heater core and heater water hoses with water and install Plug BT-7422-B and adapter BT-7422-A from the radiator/heater core pressure tester in the heater water hose ends. Secure the heater water hoses, plug and adapter with hose clamps.



5. Attach the pump and gauge assembly from the radiator/heater core pressure tester to the adapter.

6. Close the bleed valve at the base of the gauge. Pump 241 kPa (35 psi) of air pressure into the heater core.

7. Observe the pressure gauge for a minimum of three minutes.

8. If the pressure drops, check the heater water hose connections to the core tubes for leaks. If the heater water hoses do not leak, remove the heater core from the vehicle and carry out the bench test.

Heater Core—Bench Test

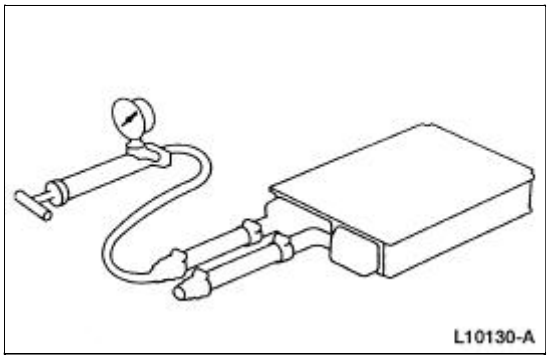
1. Remove the heater core from the vehicle. For additional information, refer to Section 412-02 .

2. Drain all of the coolant from the heater core.

3. Connect the 101 mm (4 inch) test heater water hoses with plug and adapter to the core tubes. Then connect the radiator/heater core pressure tester to the adapter.

4. Apply 241 kPa (35 psi) of air pressure to the heater core. Submerge the heater core in water.

5. If a leak is observed, install a new heater core.



A/C Evaporator/Condenser Core—On-Vehicle Leak Test

1. Discharge and recover the refrigerant. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

2. **NOTE:** DO NOT leak test an A/C evaporator core with the suction accumulator/drier (19C836) attached to the core tubes.

   Disconnect the suspect A/C evaporator core or A/C condenser core from the A/C system. For additional information, refer to Section 412-03 .

3. Clean the spring lock couplings. For additional information, refer to Spring Lock Coupling in this section.

4. Connect the appropriate test fittings from the A/C Test Fitting Set to the evaporator or condenser tube connections.

5. **NOTE:** The automatic shut-off valves on some gauge set hoses do not open when connected to the test fittings. If available, use hoses without shut-off valves. If hoses with shut-off valves are used, make sure the valve opens when attached to the test fittings or install an adapter which will activate the valve. The test is not valid if the shut-off valve does not open.

   Connect the red and blue hoses from the manifold gauge set to the test fittings on the A/C evaporator core or A/C condenser core. Connect the yellow hose to a known good vacuum pump.

6. Open both gauge set valves and start the vacuum pump. Allow the vacuum pump to operate for a minimum of 45 minutes after the gauge set low pressure gauge indicates 101 kPa (30 in-Hg). The 45-minute evacuation is necessary to remove any refrigerant from oil left in the A/C evaporator core or A/C condenser core. If the refrigerant is not completely removed from the oil, outgassing will degrade the vacuum and appear as a refrigerant leak.

7. If the low pressure gauge reading will not drop to 101 kPa (30 in-Hg) when the valves on the gauge and manifold set are open and the vacuum pump is operating, close the gauge set valves and observe the low pressure gauge. If the pressure rises rapidly to zero, a large leak is indicated. Recheck the test fitting connections and gauge set connections before installing a new A/C evaporator core or A/C condenser core.

8. After evacuating for 45 minutes, close the gauge set valves and stop the vacuum pump. Observe the low pressure gauge; it should remain at the 101 kPa (30 in-Hg) mark.
   - If the low pressure gauge reading rises 34 or more kPa (10 or more in-Hg) of vacuum from the 101 kPa (30 in-Hg) position in 10 minutes, a leak is indicated.
   - If a very small leak is suspected, wait 30 minutes and observe the vacuum gauge.
   - If a small amount of vacuum is lost, operate the vacuum pump with gauge valves open for an additional 30 minutes to remove any remaining refrigerant from the oil in the A/C

evaporator core or A/C condenser core. Then recheck for loss of vacuum.

- If a very small leak is suspected, allow the system to sit overnight with vacuum applied and check for vacuum loss.

9. If the A/C evaporator core or A/C condenser core does leak, as verified by the above procedure, install a new A/C evaporator core or A/C condenser core. For additional information, refer to Section 412-03 .

A/C Compressor—External Leak Test

1. Install the A/C pressure test adapter on the rear head of the A/C compressor using the existing manifold retaining bolt.

2. Connect the high and low pressure lines of a manifold gauge set or a refrigerant recovery/recycling station such as the R-134a A/C Service Center to the corresponding fittings on the A/C pressure test adapter.

3. Attach the center hose of the manifold gauge set to a refrigerant container standing in an upright position.

4. Hand-rotate the compressor shaft 10 complete revolutions to distribute the oil inside the A/C compressor.

5. Open the low pressure gauge valve, the high pressure gauge valve and the valve on the refrigerant container to allow the refrigerant vapor to flow into the A/C compressor.

6. Using the Refrigerant Leak Detector, check for leaks at the compressor shaft seal and the compressor center seal.

7. If a shaft seal leak is found, install a new shaft seal. For additional information, refer to Section 412-03 . If an external leak is found at the center joint of the A/C compressor, install a new A/C compressor.

8. When the leak test is complete, recover the refrigerant. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

Air Conditioning (A/C) System Check — Retail Procedure

NOTE: This Retail Procedure is not eligible for claiming on Ford paid repairs (warranty and ESP).

NOTE: The engine should be run at idle for 10 minutes with the air conditioning on and set to MAX A/C before carrying out this retail procedure.

NOTE: Read and follow all of the Warnings, Cautions and Notes at the beginning of this section before continuing.

1. **Visual inspection**
   Open the hood and visually inspect the heating and air conditioning systems for the following:
   - Coolant reservoir for correct coolant level
   - Heater hoses for deterioration or loose connections
   - Radiator and condenser for debris or damaged fins restricting airflow, loose mounting or connections
   - Accessory drive belt(s) and cooling fan(s) for wear or physical damage
   - Refrigerant lines and connections for physical damage or loose connections
   - Compressor for physical damage or loose connections
   - Suction accumulator/drier for physical damage or loose connections
   - Wiring and connectors for excessive wear, loose or damaged connections, or incorrect routing

2. **A/C refrigerant analysis**
   - Carry out air conditioning refrigerant analysis. For additional information, refer to Refrigerant Identification Testing in this section.
   - If the refrigerant fails the analysis, discontinue diagnosis and make recommendations for repairs.
   - If the refrigerant passes the analysis, carry out the air conditioning system check.

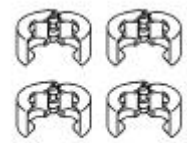
3. **Air conditioning system check**
   - Connect manifold gauge set or charging station with gauges to refrigerant system.
   - With the vehicle in park, parking brake set, thermometer installed in center panel vent, and air conditioning system on and set to MAX A/C, start the engine.
   - Record air refrigerant system pressures while running the engine at 1,500 rpm and allow engine to return to idle.
   - Operate the blower motor in all control positions and check for correct blower speed changes.
   - With the blower motor on HI, operate air discharge mode selector in all positions and check for correct airflow in each position.
   - Operate the temperature blend selector in all positions and check for correct change in discharge temperature. Check the air discharge temperature with the selector in the coolest position and the air conditioning on and set to MAX A/C to determine if the air discharge temperature is acceptable for the current ambient air temperature.
   - Carry out the EATC self-test (if applicable).
     If the refrigerant system pressures were low, carry out the refrigerant system leak test.

4. **Refrigerant system leak test**

   - Use either an ultraviolet (UV) or an electronic leak detector to check for leaks at all refrigerant lines, connections, and components.
     After all tests have been completed, report all findings and recommended repairs to your service advisor before carrying out further diagnostic procedures.

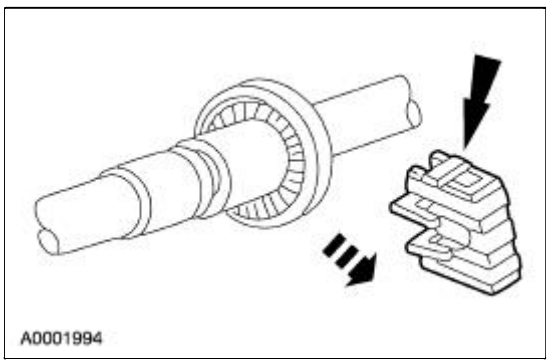
Spring Lock Coupling

Special Tool(s)

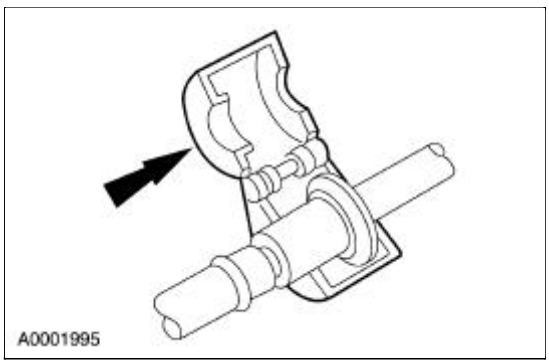
 ST2352-A	Remover, Refrigerant Coupling Set 412-039 (T84L-19623-B)

Disconnect

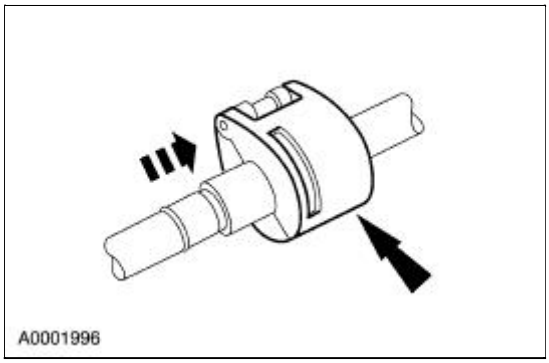
1. Remove the A/C tube lock coupling clip (19E746), if equipped.


A0001994

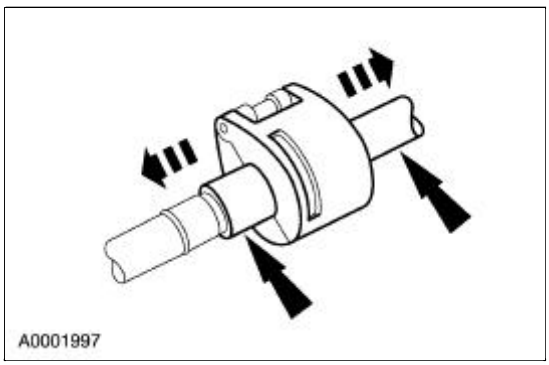
2. Fit the special tool to the spring lock coupling.


A0001995

3. Push the tool into the cage opening to release the female fitting from the A/C tube lock coupling spring (19E576).

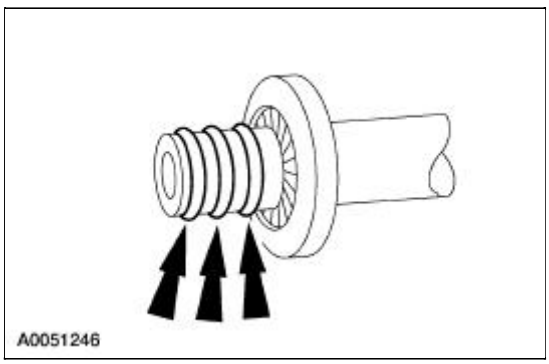


4. Pull the spring lock coupling fittings apart.



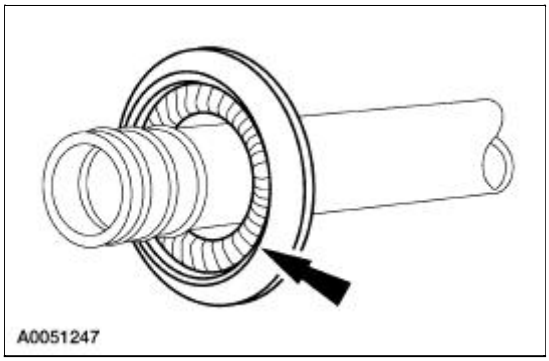
5. **CAUTION: Do not use metal tools to remove the O-ring seals. They can cause axial scratches across the O-ring seal grooves, resulting in refrigerant leaks.**

   Remove the O-ring seals with a non-metallic tool.



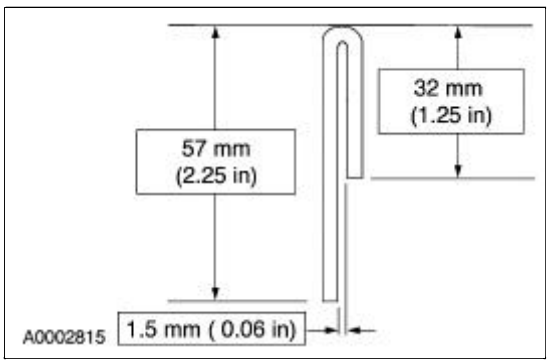
6. **CAUTION: Do not use a screwdriver or similar tool to remove the A/C tube lock coupling spring; this can cause axial scratches across the O-ring seal grooves resulting in refrigerant leaks.**

   Remove the A/C tube lock coupling spring with a small hooked wire.



Cleaning

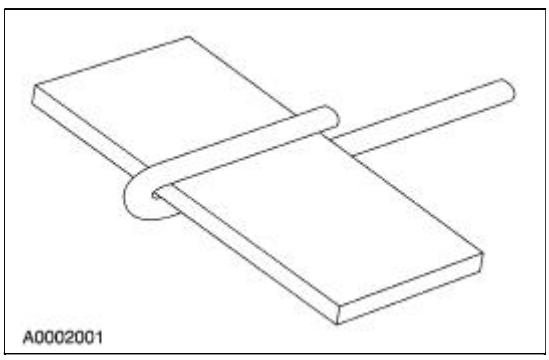
1. Fabricate a cleaning tool from a 1/8 inch diameter brazing rod.



2. Cut an abrasive pad from maroon colored 3M Scotch Brite® with the dimensions corresponding to the coupling size.

Coupling Size	Pad Size
3/8 inch	25 x 50 mm (1 x 2 inch)
1/2 inch	25 x 50 mm (1 x 2 inch)
5/8 inch	25 x 76 mm (1 x 3 inch)
3/4 inch	25 x 102 mm (1 x 4 inch)

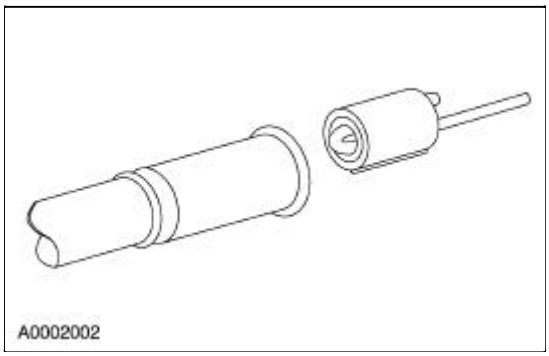
3. Assemble the pad to the tool.



4. Coat the abrasive pad with PAG Refrigerant Compressor Oil (R-134a Systems) or equivalent.
5. Roll the pad on the tool and install it in a variable speed drill motor.
6. **CAUTION: Maintain low speed drill rotation when inserting or removing the cleaning**

tool to prevent axial scratches which may cause future leaks.

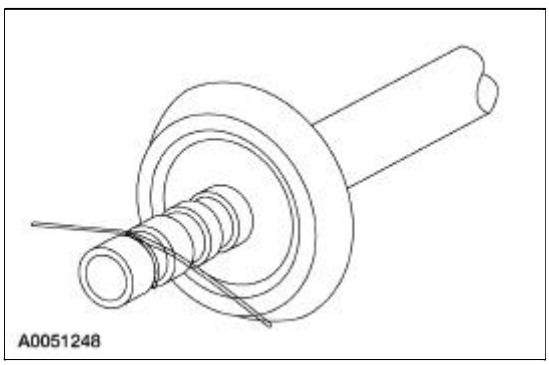
Polish for one minute at moderate speed (less than 1,500 rpm) or until the surface is clean and free of scratches or foreign material.



7. Clean the fitting with a lint-free cloth.

8. Inspect the surface for grooves or scratches. If grooves and scratches are still present, install a new component.

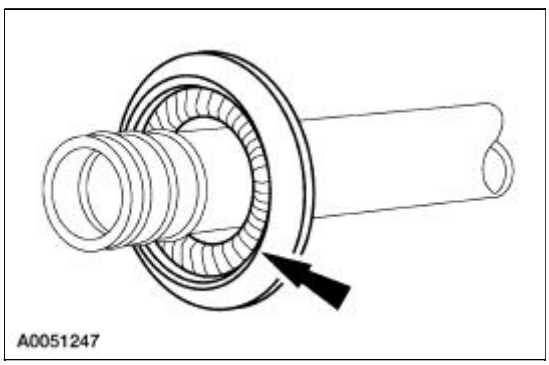
9. Clean the O-ring seal grooves with a 300 mm (12 inch) length of natural fiber string.
    - Loop the string around the grooves and pull the string back and forth.



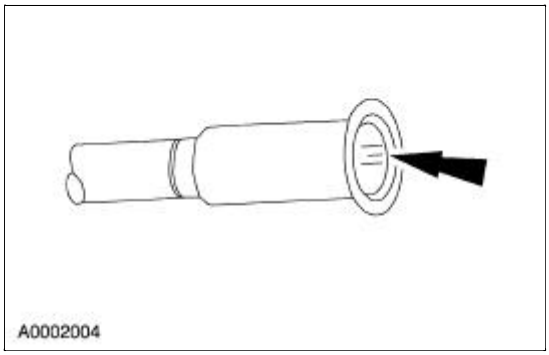
10. Remove any foreign material from the grooves with a lint-free cloth.

Connect

1. Install the A/C tube lock coupling spring.



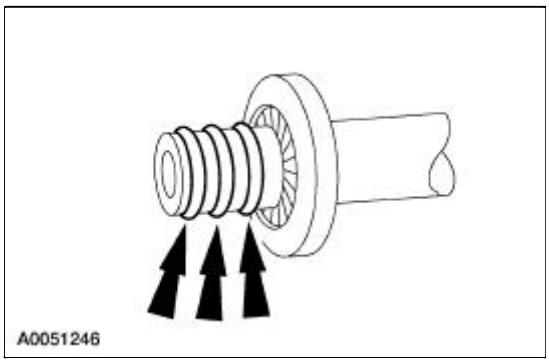
2. Lubricate the inside of the coupling with PAG Refrigerant Compressor Oil (R-134a Systems) or equivalent.



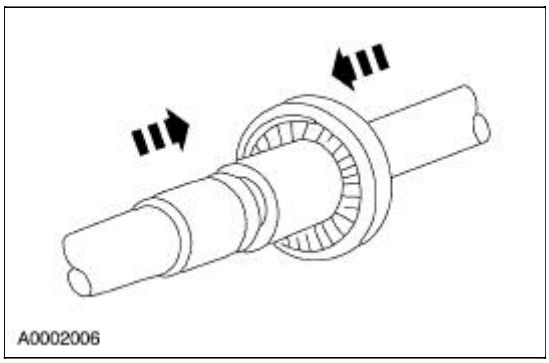
3. **CAUTION: Use only the new O-ring seals. The use of any O-ring seals other than those specified in the Ford Master Parts Catalog may result in intermittent leakage during vehicle operation.**

   Install the O-ring seals.

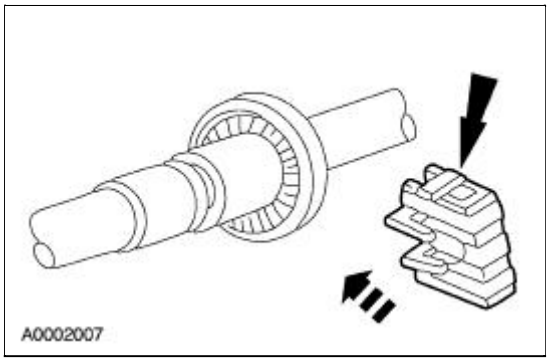
   - Lubricate the O-ring seals with PAG Refrigerant Compressor Oil (R-134a Systems) or equivalent.



4. Connect the spring lock coupling fittings with a twisting motion until the A/C tube lock coupling spring snaps over the flared end of the female fitting.



5. Install the A/C tube lock coupling clip.


A0002007

Heater Hose Coupling

Special Tool(s)

ST1648-A	Remover, Heater Hose Inlet Tube 412-042 (T85T-18539-AH)
ST2589-A	Disconnect Tool, Heater Hose 412-127

Material

Item	Specification
MERPOL® —	ESE-M99B144-B

Disconnect

CAUTION: Do not attempt to install a new bushing, spacer or O-rings in the heater hose coupling; damage to the heater hose coupling can result. If the heater hose coupling is the cause of a coolant leak, the affected heater hose must be replaced as an assembly.

1. **WARNING: The engine must be off, fully cool and the cooling system fully depressurized before attempting to disconnect any heater water hoses. Failure to comply with this warning can result in serious injury or burns from hot liquid escaping out of the engine cooling system.**

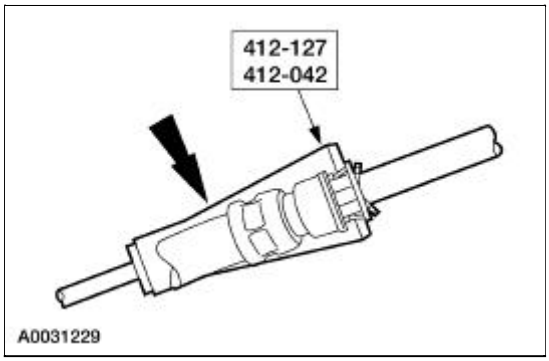
   Depressurize the engine cooling system.

2. Push the heater hose toward the tube to fully expose the locking tabs.

3. **NOTE:** When compressing the white coupling retainer with the special tool, the special tool must be perpendicular to and on the highest point of the coupling.

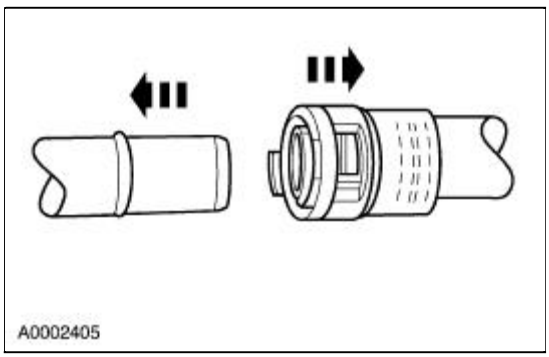
   NOTE: If the heater hose coupling is accessible, the retainer tabs can be compressed by hand to disconnect the heater hose.

   Push the special tool over the coupling retainer windows to compress the retainer locking tabs.

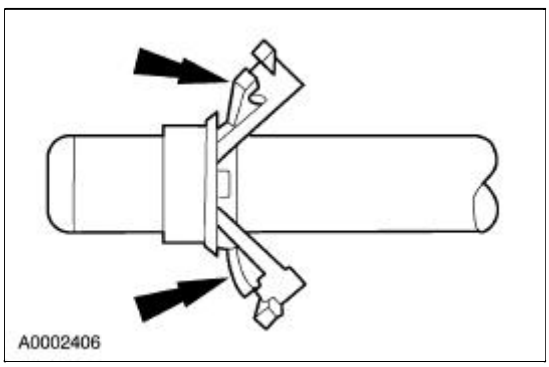


4. **NOTE:** A slight twisting motion while pulling on the heater water hose may be necessary to assist in the removal.

   Pull the heater hose away from the heater core tube.



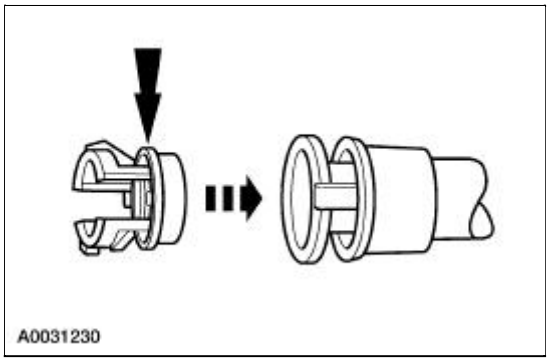
5. Spread the retainer tabs apart and slide the retainer off the tube.
   - Discard the retainer.



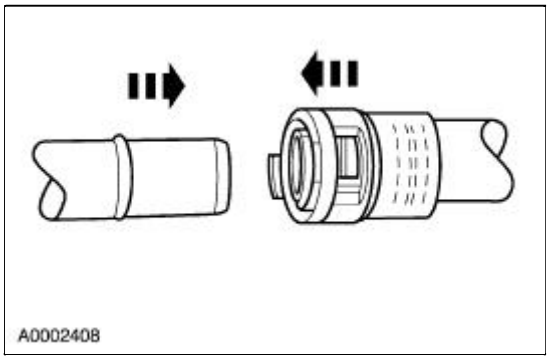
Connect

1. Clean the tubes and lubricate with coolant hose lubricant or plain water.

2. Install a new coupling retainer (18D434) into the heater hose coupling housing.



3. Push the heater hose coupling onto the tube.



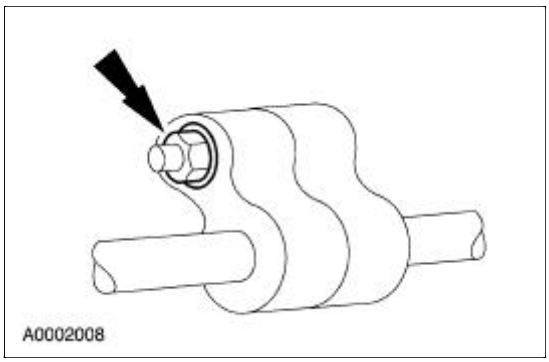
4. Make sure the heater hose coupling is fully engaged by lightly pulling on the heater hose.

Air Conditioning Line (Peanut) Fitting

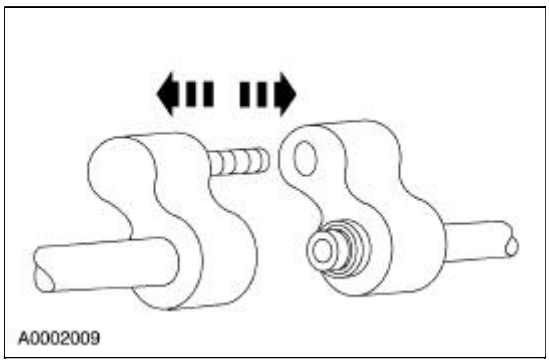
Disconnect

1. **CAUTION: Support the female fitting with a wrench to prevent the tubes from twisting.**

   Remove the nut from the peanut fitting.

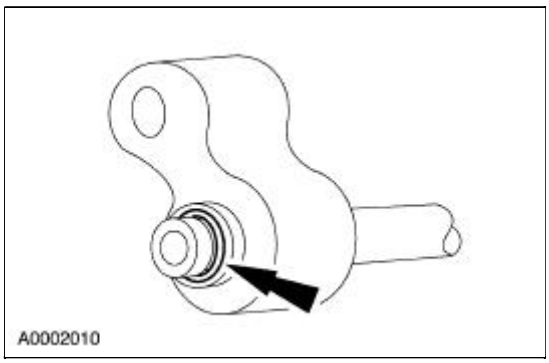


2. Pull the peanut fitting apart.



3. **CAUTION: Do not use metal tools to remove the O-ring seal. They can cause axial scratches across the O-ring seal groove, resulting in refrigerant leaks.**

   Remove the O-ring seal with a non-metallic tool.



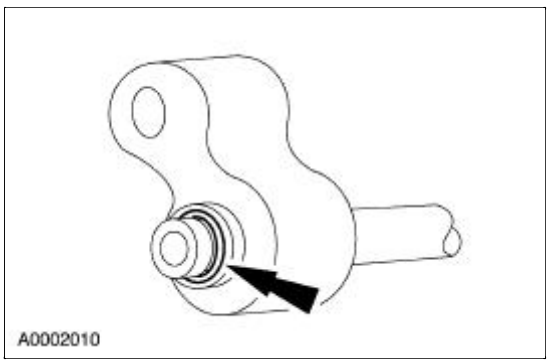
Connect

1. Clean all dirt or foreign material from the fittings.

2. **CAUTION: Use only the new O-ring seals. The use of any O-ring seals other than those specified in the Ford Master Parts Catalog may result in intermittent leakage during vehicle operation.**

   Install the O-ring seal.

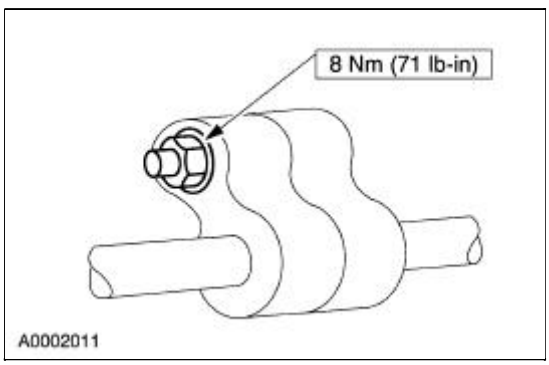
   - Lubricate the O-ring seal with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.



3. Lubricate the inside of the fittings with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.

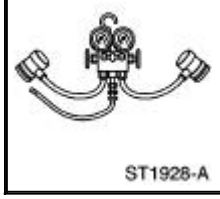
4. **NOTE:** When correctly assembled, the male and female fittings should be flush.

   Assemble the male and female fittings together.



Refrigerant System Tests

Special Tool(s)

 ST1928-A	R-134a Manifold Gauge Set 176-R032A or equivalent

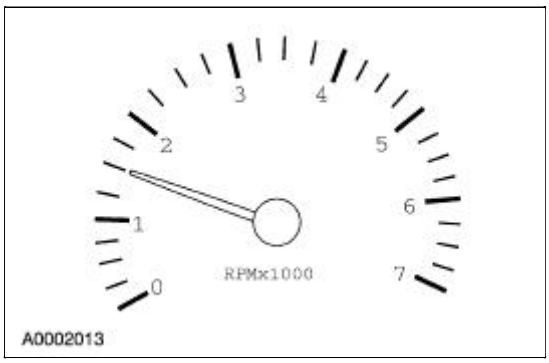
1. Connect the R-134a Manifold Gauge Set. For additional information, refer to Manifold Gauge Set Connection in this section.

2. Adjust the climate controls for maximum cooling.
   - Start the engine.
   - Select MAX A/C operation.
   - Set the blower motor speed to maximum.

3. Stabilize the in-vehicle temperature at 21-27°C (70-80°F).

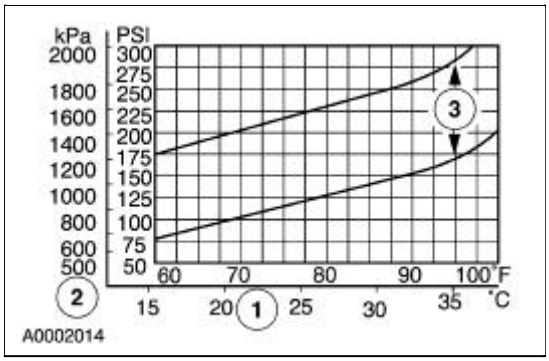
4. **NOTE:** When the ambient temperatures exceed 38°C (100°F), do not run the engine above normal idle speed.

   Maintain the engine speed at 1,500 rpm.



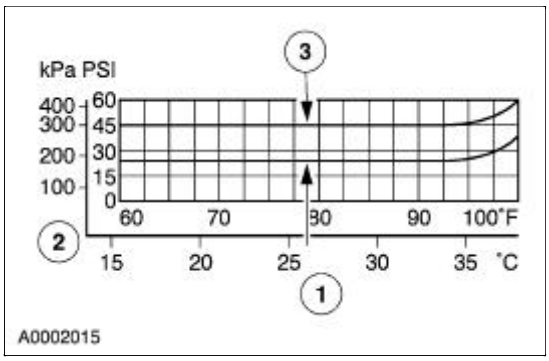
5. Determine the compressor discharge (high) pressure.
   1. Record the ambient temperature.
   2. Record the discharge (high) pressure.
   3. **NOTE:** In ambient temperatures between 38-43°C (100-110°F), the system performance pressures will be the same as those for ambient temperatures shown on the chart in the 32-38°C (90-100°F) range.

      The system performance is acceptable when the pressure reading falls between the upper and lower limits shown.



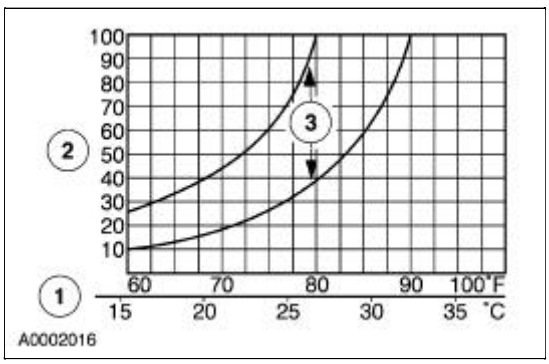
6. Determine the compressor suction (low) pressure.
    1. Record the ambient temperature.
    2. Record the suction (low) pressure.
    3. **NOTE:** In ambient temperatures between 38-43°C (100-110°F), the system performance pressures will be the same as those for ambient temperatures shown on the chart in the 32-38°C (90-100°F) range.

       The system performance is acceptable when the pressure reading falls between the upper and lower limits shown.



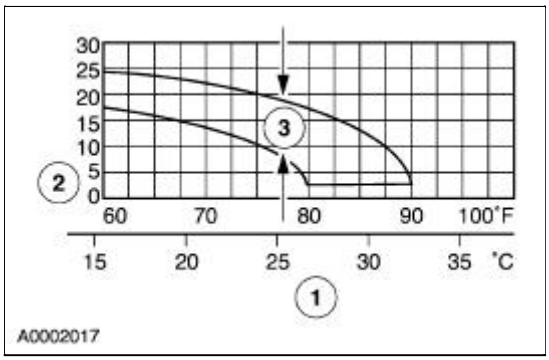
7. Determine the A/C clutch ON time.
    1. Record the ambient temperature.
    2. Record the A/C clutch ON time in seconds.
    3. **NOTE:** When the ambient temperature is above 26°C (80°F), the A/C clutch may not cycle.

       The system performance is acceptable when the recorded time falls between the upper and lower limits shown.



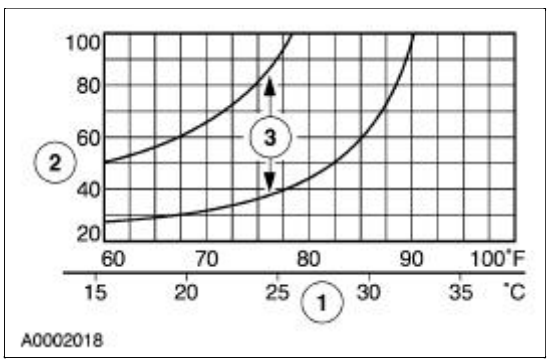
8. Determine the A/C clutch OFF time.
    1. Record the ambient temperature.
    2. Record the A/C clutch OFF time in seconds.
    3. **NOTE:** When the ambient temperature is above 26°C (80°F), the A/C clutch may not cycle.

The system performance is acceptable when the recorded time falls between the upper and lower limits shown.



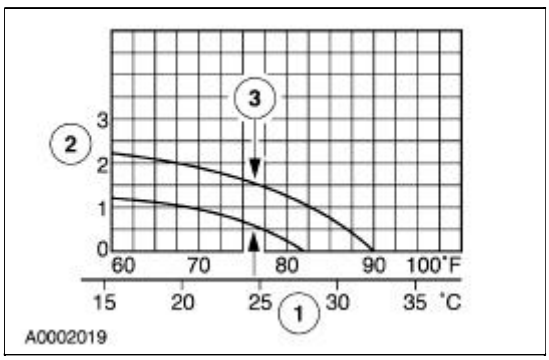
9. Determine the total A/C clutch cycle time.
    1. Record the ambient temperature.
    2. Record the time the A/C clutch is engaged plus the time it is disengaged (time ON plus time OFF).
    3. **NOTE:** When the ambient temperature is above 26°C (80°F), the A/C clutch may not cycle.

    The system performance is acceptable when the recorded time falls between the upper and lower limits shown.



10. Determine the A/C clutch cycle rate per minute.
    1. Record the ambient temperature.
    2. Record the number of A/C clutch cycles occurring in one minute.
    3. **NOTE:** When the ambient temperature is above 26°C (80°F), the A/C clutch may not cycle.

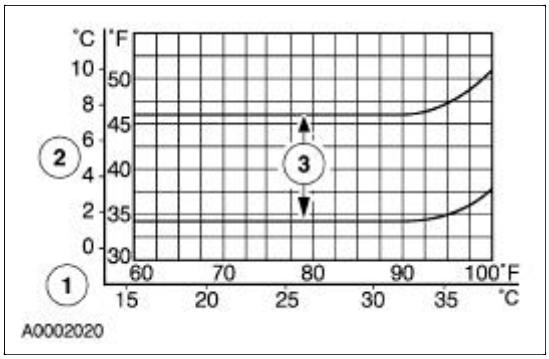
    The system performance is acceptable when the recorded number of cycles falls between the upper and lower limits shown.



11. Determine the center A/C register discharge temperature.
    1. Record the ambient temperature.

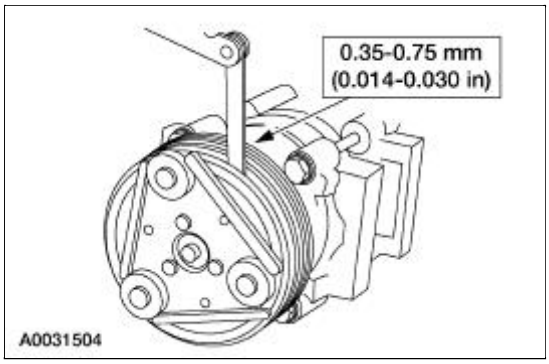
2. Record the center A/C register discharge temperature.
3. **NOTE:** In ambient temperatures between 38-43°C (100-110°F), the A/C register discharge temperatures will be the same as those for ambient temperatures shown on the chart in the 32-38°C (90-100°F) range.

   The system performance is acceptable when the center A/C register discharge temperature falls between the upper and lower limits shown.



Air Conditioning (A/C) Clutch Air Gap Adjustment

1. Check the A/C clutch air gap at three equally-spaced places between the A/C clutch hub (2884) and the A/C clutch pulley (2E884).



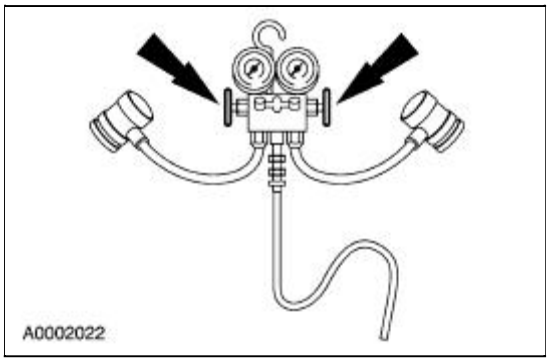
2. Remove the A/C clutch. Add or remove spacers between the A/C clutch and the compressor shaft until clearance is within specification. For additional information, refer to Section 412-03 .

Manifold Gauge Set Connection

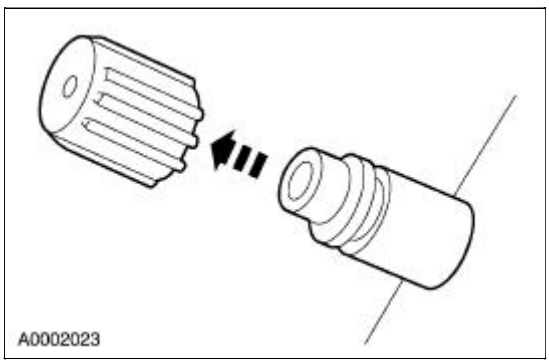
Special Tool(s)

ST1928-A	R-134a Manifold Gauge Set 176-R032A or equivalent

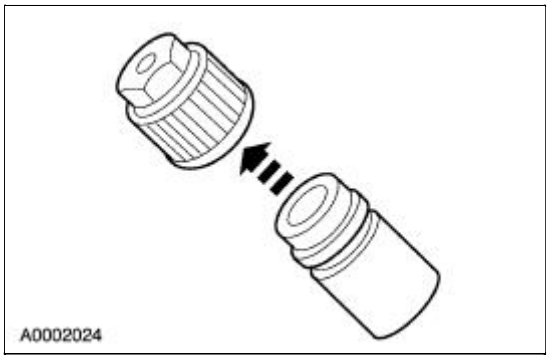
1. Turn both valves on the R-134a Manifold Gauge Set clockwise to close the low- and high-pressure hoses to the center manifold and center hose.



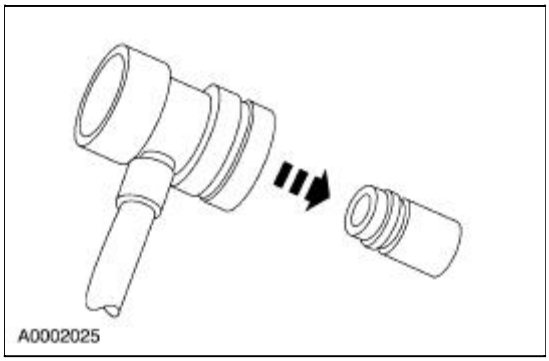
2. Remove the A/C charging valve cap (19D702) from the low-pressure service gauge port valve.



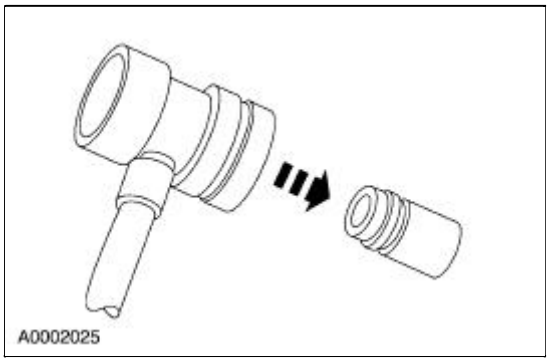
3. Remove the A/C charging valve cap from the high-pressure service gauge port valve.



4. Connect the R-134a Manifold Gauge Set low-pressure hose and the R-134a low side quick disconnect to the low-pressure service gauge port valve.



5. Connect the R-134a Manifold Gauge Set high-pressure hose and the R-134a high side quick disconnect to the high-pressure service gauge port valve.



Electronic Leak Detection

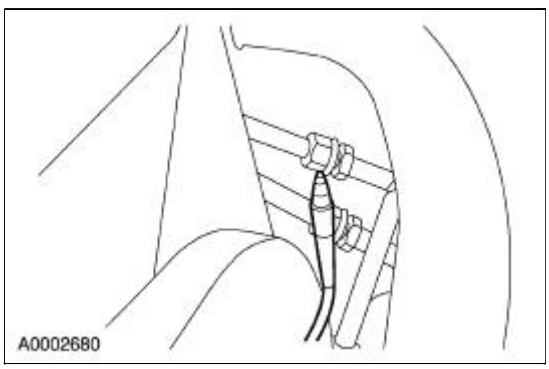
Special Tool(s)

ST2351-A	H10PM Refrigerant Leak Detector With Battery 216-00001 or equivalent

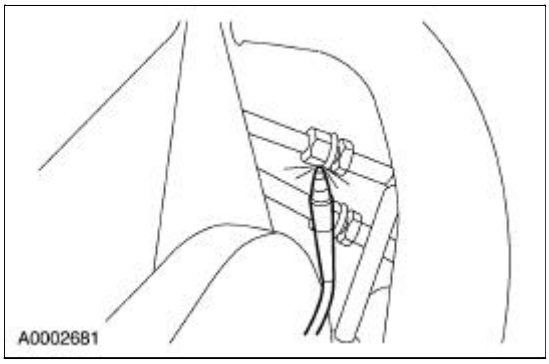
CAUTION: Good ventilation is necessary in the area where electronic A/C leak testing is to be carried out. If the surrounding air is contaminated with refrigerant gas, the leak detector will indicate this gas all the time. Odors from other chemicals such as anti-freeze, diesel fuel, disc brake cleaner, or other cleaning solvents can cause the same problem. A fan, even in a well-ventilated area, is very helpful in removing small traces of contamination from the air that might affect the leak detector.

1. **NOTE:** The system pressure should be between 413-551 kPa (60-80 psi) at 24°C (75°F) with the engine off.

   Leak test the refrigerant system using the Refrigerant Leak Detector. Follow the instructions included with the leak detector for handling and operation techniques.

   
   A0002680

2. If a leak is found, discharge and recover the refrigerant. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.
   - Repair the system.
   - Test the system for normal operation.


A0002681

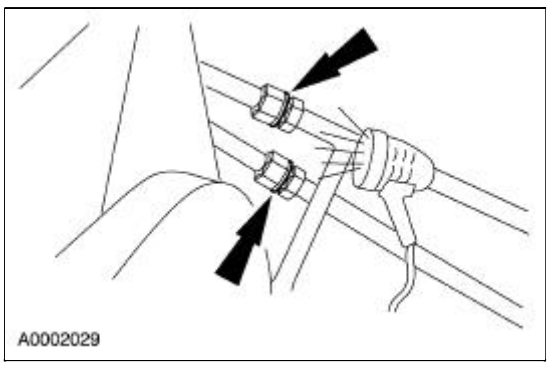
Tracer Dye Leak Detection

Special Tool(s)

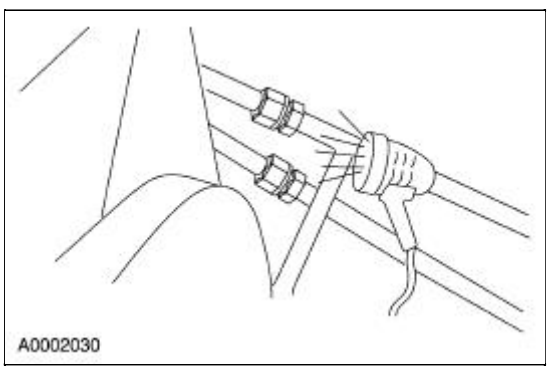
ST1261-A	120 Watt 110 Volt UV Lamp 20°C 164-R0721 or equivalent

NOTE: Ford Motor Company vehicles are produced with a permanent leak tracer dye incorporated into the A/C system. The location of leaks can be pinpointed by the bright yellow-green glow of the tracer dye. Since more than one leak can exist, always inspect each component.

1. Check for leaks using a 120 Watt UV spot lamp.
   - Scan all components, fittings and lines of the A/C system.

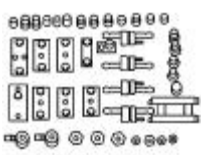


2. After the leak is repaired, remove any traces of tracer dye with a general purpose oil solvent.
3. Verify the repair by operating the system for a short time and inspect with the UV spot lamp.



Air Conditioning (A/C) System Flushing

Special Tool(s)

ST2466-A	A/C Flush and Purge Machine 219-00022 (part of 219-00023) or equivalent
 ST2469-A	A/C Flush and Purge Fitting Kit 219-00024 (part of 219-00023) or equivalent

WARNING: Use extreme care and observe all safety and service precautions related to the use of refrigerants.

WARNING: Due to refrigerant hazards, always wear safety goggles and non-penetrable gloves when working on or flushing A/C systems.

CAUTION: An A/C refrigerant analyzer must be used before the recovery of any vehicle's A/C refrigerant. Failure to do so puts the shop's bulk refrigerant at risk of contamination. If the vehicle's A/C refrigerant is contaminated, refer the customer to the service facility that carried out the last A/C service. If the customer wishes to pay the additional cost, use the A/C recovery equipment that is designated for recovering contaminated A/C refrigerant. All contaminated A/C refrigerant must be disposed of as hazardous waste. For all equipment, follow the equipment manufacturer's procedures and instructions.

CAUTION: Suction accumulator/drier, muffler, hoses, thermal expansion valve, and fixed orifice tube should be removed when flushing the A/C system. Internal plumbing of these devices makes it impossible to correctly remove any residual-flushing agent. Except for the hoses, these components are typically discarded after A/C system contamination. Hoses can normally be reused unless they are clogged with foreign material. The 3.785 liters (1 gallon) of A/C Systems Flushing Solvent F4AZ-19579-A and FL1-A filter used in A/C Flush and Purge Machine 219-00022 are intended for use on one vehicle only. They may be used to flush both the A/C condenser core and the A/C evaporator core on an individual vehicle, but under no circumstances should they be used on more than one vehicle.

1. **NOTE:** Prior to using the A/C Flush and Purge Machine 219-00022 for the first time, review the operating instructions.

   NOTE: Only the A/C Flush and Purge Machine kit 219-00023, which includes A/C Flush and Purge Machine 219-00022, A/C Flush and Purge Fitting Kit 219-00024, and the Ford Part number F4AZ-19579-A A/C Systems Flushing Solvent, is approved for use on Ford vehicles. No other flushing device or solvent is approved for flushing heat exchangers. Use of any other flusher or solvent may cause damage to the A/C system and the flushing unit.

Ford Motor Company has approved a procedure to provide technicians with a non-CFC method of flushing contaminated A/C system heat exchangers, A/C evaporator core, and A/C condenser core. The procedure allows the specific components to be cleaned and flushed while installed in their normal in-vehicle location. The types of contamination flushed include particle matter that results from A/C compressor or desiccant failure within the suction accumulator/drier and gummy residue that can form when refrigerant oil is overheated during A/C compressor seizure. The flushing process is a two-step procedure that involves the use of an A/C Flush and Purge Machine 219-00022 to:

- Circulate the flushing solvent through the heat exchanger in the reverse direction of normal refrigerant flow (back-flushing). Particulate matter picked up during flushing is filtered from the returning solvent before the solvent is returned to the reservoir for continued circulation.
- Remove the flushing solvent from the heat exchanger. In this step of the procedure, pressurized air 621-862 kPa (90-125 psi) is used to push and evaporate any remaining flush solvent from the heat exchanger.

2. Discharge the A/C system. Observe all safety precautions. For additional information, refer to the procedure in this section.

3. Disconnect the refrigerant lines from the heat exchanger(s) to be flushed.

4. Connect the A/C Flush and Purge Machine 219-00022 and A/C Flush and Purge Fitting Kit 219-00024 to the heat exchanger to be flushed. Do not flush through the A/C evaporator core orifice, mufflers or hoses. Internal plumbing and material make-up of these components make it impossible to correctly remove foreign material or residual flushing solvent.

5. Use 3.785 liters (one gallon) of A/C Systems Flushing Solvent part number F4AZ-19579-A to flush the heat exchanger for a minimum of 15 minutes. The flush solvent may be used for one or both heat exchangers in the A/C system. However, the flush solvent is intended for one vehicle only. The filter used on the flushing unit is also intended for use on one vehicle only.

6. Flush the component for a minimum of 15 minutes.

7. Apply 621-862 kPa (90-125 psi) pressurized air to the component for a minimum of 30 minutes. The 30-minute purge time is required to force and evaporate all residual solvent from the A/C system component. Failure to successfully remove all residual solvent within the component can result in system damage when reconnected and operated. Dispose of the used flush solvent and filter in accordance with local, state and federal emissions.

8. **NOTE:** A/C system filtering as described in this section is optional if system flushing is carried out. However, the filter kit use is recommended after flushing if the A/C system contamination is extensive.

   Install a new A/C evaporator core orifice in any vehicle being serviced for A/C compressor or desiccant failure.

9. Install new refrigerant hoses if clogged with foreign material.

10. Reconnect the heat exchanger being serviced.

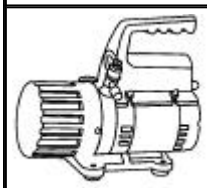
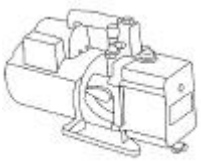
11. Add additional refrigerant oil as required. For additional information, refer to the procedure in this section.

12. Evacuate, leak test and charge the A/C system. For additional information, refer to the procedure in this section.

13. Check the system for normal operation.

Air Conditioning (A/C) System Recovery, Evacuation and Charging

Special Tool(s)

ST1226-A	R-134a A/C Refrigerant Center 176-00002 or equivalent
ST1834-A	R-134a A/C Refrigerant Center 023-00153 or equivalent
ST1928-A	R-134a Manifold Gauge Set 176-R032A or equivalent
 ST1685-A	1.2 CFM Vacuum Pump 023-00162 or equivalent
 ST1686-A	4.0 CFM Vacuum Pump 023-00163 or equivalent

Refrigerant System Recovery

NOTE: Ford Motor Company recommends use of an A/C service center to carry out recovery, evacuation, and charging of the refrigerant system. If an A/C service center is not available, refrigerant system recovery, evacuation, and charging may be accomplished using a separate recovery station, vacuum pump, charging cylinder, and manifold gauge set.

1. Prior to recovering the refrigerant system, you must verify the purity of the refrigerant. For additional information, refer to Refrigerant Identification Testing in this section.

2. **NOTE:** Some R-134a service centers require the use of an A/C manifold gauge set. For additional information, refer to Manifold Gauge Set Connection in this section.

Connect an R-134a A/C service center to the low- and high-pressure service gauge port valves.

3. Recover the refrigerant from the system following the operating instructions provided by the equipment manufacturer.

4. Once the service center has recovered the vehicle A/C system refrigerant, close the service center inlet valve (if equipped). Then switch off the power supply.

5. Allow the vehicle A/C system to remain closed for about two minutes. Observe the system vacuum level as shown on the gauge. If the vacuum does not decrease, disconnect the refrigerant center hose(s).

6. If the system vacuum does decrease, repeat Steps 2 through 5 until the vacuum level remains stable for two minutes.

7. Carry out the required repairs.

Refrigerant System Evacuation

NOTE: Ford Motor Company recommends use of an A/C service center to carry out recovery, evacuation, and charging of the refrigerant system. If an A/C service center is not available, refrigerant system recovery, evacuation, and charging may be accomplished using a separate recovery station, vacuum pump, charging cylinder, and manifold gauge set.

1. Connect an R-134a service center to the low- and high-pressure service gauge port valves.

2. Evacuate the system until the low-pressure gauge reads at least 99.4 kPa (29.5 in-Hg) of vacuum and as close to 101.1 kPa (30 in-Hg) as possible. Continue to operate the vacuum pump for a minimum of 45 minutes.

3. Turn off the vacuum pump. Observe the low-pressure gauge for five minutes to make sure that the system vacuum is held. If vacuum is not held for five minutes, leak test the system, service the leak, and evacuate the system again.

Refrigerant System Charging

NOTE: Ford Motor Company recommends use of an A/C service center to carry out recovery, evacuation, and charging of the refrigerant system. If an A/C service center is not available, refrigerant system recovery, evacuation, and charging may be accomplished using a separate recovery station, vacuum pump, charging cylinder, and manifold gauge set.

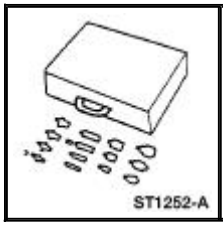
1. Correctly oil match the system to verify that the correct amount of refrigerant oil is present in the system. For additional information, refer to Refrigerant Oil Adding in this section.

2. Charge the system with the specified amounts of refrigerant oil and refrigerant.

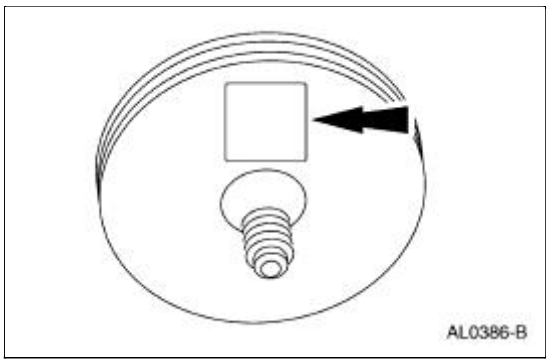
3. When no more refrigerant is being drawn into the system, start the engine and select MAX A/C operation. Adjust the blower motor speed to the maximum and allow the remaining refrigerant to be drawn into the system. Continue to add refrigerant into the system until the specified weight of R-134a has been added. Close the charging cylinder valve and allow the system to pull any remaining refrigerant from the hose. When the low-pressure drops to approximately 207 kPa (30 psi), close the charging hose valve.

Refrigerant System Filtering Following Air Conditioning (A/C) Component Installation

Special Tool(s)

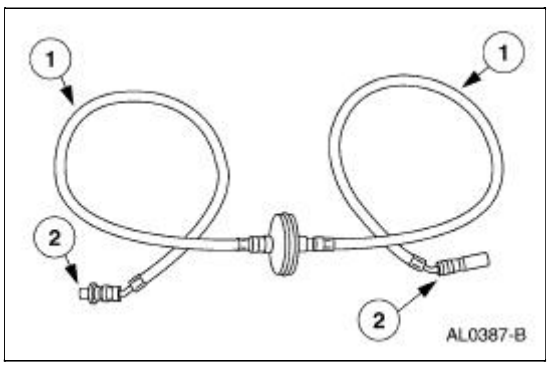
 ST1252-A	Set, A/C Fittings 412-DS028 (014-00333, D93L-19703-B) or equivalent

1. Install the new A/C compressor. For additional information, refer to Section 412-03 .
2. Install the new suction accumulator/drier. For additional information, refer to Section 412-03 .
3. Install the new A/C evaporator core orifice. For additional information, refer to Section 412-03 .
4. Orient the filter inlet toward the A/C condenser core.



5. **NOTE:** The pancake filter is not permanently installed and will be removed at the end of this procedure.

   Temporarily install the pancake filter between the A/C condenser core and the condenser to evaporator tube.
   1. Use flexible refrigerant hose of 17,238 kPa (2,500 psi) burst rating.
   2. Make the connections using the A/C Test Fitting Set.



6. Correctly oil match the system. For additional information, refer to Refrigerant Oil Adding in this section.

7. Evacuate and charge the system. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

8. Check all refrigerant system hoses, lines and the position of the newly installed filters to be sure they do not interfere with other engine compartment components. If necessary, use tie straps to make adjustments.

9. Provide adequate airflow to the front of the vehicle (with a fan, if necessary). Select MAX A/C operation and set the blower motor speed to maximum. Start the engine and let it idle briefly. Make sure the A/C system is operating correctly.

10. Gradually bring the engine up to 1,200 rpm by running it at lower rpms for short periods (first at 800 rpm, then at 1,000 rpm). Set the engine at 1,200 rpm and run it for one hour with the A/C system operating.

11. Stop the engine.

12. Recover the refrigerant from the system. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

13. Remove the fittings, flexible hoses and pancake filter from between the and the condenser to evaporator tube.

14. Discard the pancake filter. It can be used one time only.

15. Reconnect the condenser to evaporator tube to the A/C condenser core.

16. Evacuate and charge the system. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

Refrigerant Oil Adding

CAUTION: During normal A/C operation, oil is circulated through the system with the refrigerant, and a small amount is retained in each component. If certain components of the system are removed for new installation, some of the refrigerant oil will go with the component. To maintain the original total oil charge, it is necessary to compensate for the oil lost by adding oil to the system with the new part.

1. **NOTE:** Service A/C compressors are shipped without compressor oil.

   Rotate the A/C compressor shaft six to eight revolutions while collecting oil in a clean measuring device.

   - If the amount of oil drained from the old A/C compressor is between 85-142 ml (3-5 ounces), pour the same amount plus 30 ml (1 ounce) of clean PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) WSH M1C231-B or equivalent into the new A/C compressor.
   - If the amount of oil that was removed from the old A/C compressor is greater than 142 ml (5 ounces), pour the same amount drained of clean PAG Refrigerant Compressor Oil (R-134a Systems) or equivalent into the new A/C compressor.
   - If the amount of oil that was removed from the old A/C compressor is less than 85 ml (3 ounces), pour 85 ml (3 ounces) of clean PAG Refrigerant Compressor Oil (R-134a Systems) or equivalent into the new A/C compressor.

2. For the suction accumulator/drier, drill one 13 mm (0.52 in) hole in the suction accumulator/drier cylinder and drain the oil into a calibrated container.
   - Add a quantity of new oil to match that drained from the old suction accumulator/drier plus 60 ml (2 ounces) of clean PAG Refrigerant Compressor Oil (R-134a Systems) or equivalent.

3. For the A/C evaporator core, add 89 ml (3 ounces) of clean PAG Refrigerant Compressor Oil (R-134a Systems) or equivalent to the suction accumulator/drier inlet tube.

4. For the A/C condenser core, add 30 ml (1 ounce) of clean PAG Refrigerant Compressor Oil (R-134a Systems) or equivalent to the A/C condenser core or the suction accumulator/drier inlet tube.

5. Add 60 ml (2 ounces) of clean PAG Refrigerant Compressor Oil (R-134a Systems) or equivalent to the suction accumulator/drier inlet tube when carrying out each of the following repairs:
   - installation of a new A/C evaporator core orifice
   - installation of a new A/C compressor pressure relief valve (19D644)
   - installation of a new refrigerant line
   - repair of an O-ring seal leak
   - repair of a charge port leak

6. Installation of new components that do not require discharge of refrigerant and resulting oil loss, such as the A/C cycling switch and the A/C pressure transducer, do not require additional oil.

Inspection and Assembly Requirements —Following an A/C Compressor Failure

CAUTION: To prevent refrigerant system contamination and possible failure of the new A/C compressor, carry out the following procedures.

1. **NOTE:** A dirty A/C evaporator core orifice or a condenser to evaporator tube containing black refrigerant oil and particles indicates that the A/C compressor has failed and a new A/C compressor must be installed.

   Remove and discard the A/C evaporator core orifice. For additional information, refer to Section 412-03 .

2. Remove the A/C compressor. For additional information, refer to Section 412-03 .
   - Drain the residual refrigerant oil from the A/C compressor and measure the volume for correct system oil matching. For additional information, refer to Refrigerant Oil Adding in this section.

3. **NOTE:** The suction accumulator/drier and A/C evaporator core orifice cannot be cleaned and a new A/C evaporator core orifice must be installed.

   Remove the suction accumulator/drier. For additional information, refer to Section 412-03 .
   - Drain the residual refrigerant oil from the suction accumulator/drier and measure the volume for correct oil system matching. For additional information, refer to Refrigerant Oil Adding in this section.

4. **NOTE:** System flushing is the preferred method of cleaning. However, if flushing equipment is not available, carry out system filtering.

   Carry out an A/C system flushing or filtering procedure:
   - If A/C system flushing equipment is available, clean the A/C evaporator core and the A/C condenser core by flushing. For additional information, refer to Flushing in this section.
   - If A/C system flushing equipment is not available, carry out a system filtering procedure. For additional information, refer to Refrigerant Oil Adding After A/C Component Replacement in this section.

5. Install a new A/C compressor. For additional information, refer to Section 412-03 .

6. Install the new suction accumulator/drier. For additional information, refer to Section 412-03 .

7. Install the new A/C evaporator core orifice. For additional information, refer to Section 412-03 .

8. Correctly oil match the system. For additional information, refer to Refrigerant Oil Adding in this section.

9. Evacuate and charge the system. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

Refrigerant Identification Testing

Special Tool(s)

ST1457-A	Refrigerant Identifier with Air-Radicator 198-00003 or equivalent

1. **NOTE:** An A/C refrigerant analyzer must be used to identify gas samples taken directly from the refrigeration system or storage containers prior to recovering or charging the refrigerant system.

   Follow the instructions included with the Deluxe Refrigerant Diagnostic Tool to obtain the sample for testing.

2. The diagnostic tool will display one of the following:
   - If the purity level of R-134a or R-12 is 98% or greater by weight, the green "PASS" light emitting diode (LED) will light. The weight concentrations of R-134a, R-12, R-22, hydrocarbons, and air will be displayed on the digital display.
   - If refrigerants R-134a or R-12 do not meet the 98% purity levels, the red "FAIL" LED will light and a horn will sound alerting the user of potential hazards. The weight concentrations of R-134a, R-12, R-22, and hydrocarbons will be displayed on the digital display.
   - If hydrocarbon concentrations are 2% or greater by weight, the red "FAIL" LED will light, "Hydrocarbon High" will be displayed on the digital display, and a horn will sound alerting the user of potential hazards. The weight concentrations of R-134a, R-12, R-22, and hydrocarbons will also be displayed on the digital display.

3. The percentage of air contained in the sample will be displayed if the R-134a or R-12 content is 98% or greater. The diagnostic tool eliminates the effect of air when determining the refrigerant sample content because air is not considered a contaminant, although air can affect A/C system performance. When the diagnostic tool has determined that a refrigerant source is pure (R-134a or R-12 is 98% or greater by weight) and air concentration levels are 2% or greater by weight, the diagnostic tool will prompt the user if an air purge is desired.

4. If contaminated refrigerant is detected, repeat the refrigerant identification test to verify that the refrigerant is indeed contaminated.

5. **CAUTION: If contaminated refrigerant is detected, DO NOT recover the refrigerant into R-134a or R-12 recovery/recycling equipment.**

   Recover any contaminated refrigerant using suitable recovery-only equipment designed for capturing and storing contaminated refrigerant. For additional information, refer to Contaminated Refrigerant Handling in this section.

Contaminated Refrigerant Handling

1. **CAUTION: If contaminated refrigerant is detected, DO NOT recover the refrigerant into your recovery/recycling equipment.**

   Recover the contaminated refrigerant using suitable recovery-only equipment designed for capturing and storing contaminated refrigerant.

   - This equipment must only be used to recover contaminated refrigerant to prevent the spread to other vehicles.
   - If this equipment is not available, contact an A/C repair facility in your area with the correct equipment to carry out this repair.

2. Determine and correct the cause of the customer's initial concern.

3. **NOTE:** Residual refrigerant oil in the suction accumulator/drier must be drained and measured for correct oil system matching. For additional information, refer to Refrigerant Oil Adding in this section.

   The suction accumulator/drier cannot be cleaned and a new suction accumulator/drier must be installed.
   Remove the suction accumulator/drier. For additional information, refer to Section 412-03 .

4. Clean the A/C evaporator core and the A/C condenser core by flushing. For additional information, refer to Air Conditioning (A/C) System Flushing in this section.

5. Install the new suction accumulator/drier. For additional information, refer to Section 412-03 .

6. Correctly oil match the system. For additional information, refer to Refrigerant Oil Adding in this section.

7. Evacuate and charge the system. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

8. Dispose of contaminated refrigerant according to all federal, state and local regulations.

Vacuum Hose Repair —Mini-Tube

Special Tool(s)

ST1176-A	Vacuum Pump Kit 416-D002 (D95L-7559-A) or equivalent

1. Measure the length of the damaged area of the mini-tube vacuum hose.

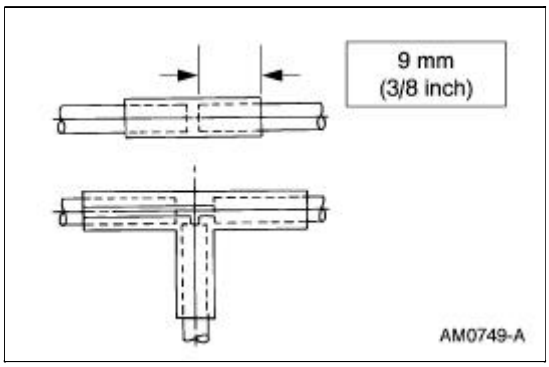
2. Cut a piece of standard 1/8 inch inner diameter vacuum hose approximately 25 mm (1 inch longer than the damaged area of the mini-tube vacuum hose).

3. Cut off the mini-tube vacuum hose on each side of the damaged area.

4. **WARNING: Read the warning information on the product label to prevent possible personal injury.**

   Dip the mini-tube hose ends in commercially available paint thinner containing methyl ethyl ketone (MEK). This solvent will seal the mini-tube in the vacuum hose.

5. Insert the ends of the mini-tube vacuum hose approximately 9 mm (3/8 inch) into the ends of the standard 1/8 inch repair vacuum hose section.



6. Shake the repair joint after assembly to make sure the solvent is dispersed and the vacuum line is not plugged.

7. Test the system for a vacuum leak in the repair area.
   - Use the Vacuum Tester or equivalent.

Torque Specifications

Description	Nm	lb-in
Steering column reinforcement	9	80
Instrument panel steering column cover bolts	9	80
Duct RH instrument panel register	9	80

Air Distribution

NOTE: The air distribution system of this vehicle cannot be equipped with a cabin air filter.

There are two sources of air available to the air distribution system:

- outside air
- recirculated air

Recirculated air is only used during MAX A/C.

Air distribution within the vehicle is determined by the function selector switch position. Airflow control doors are used to direct airflow within the air plenum chamber. Vacuum control motors (18A318) are used to position these airflow control doors. Refer to Section 412-00 for a description and operation of each of the system functions.

The air distribution system is designed to provide airflow from the defrost nozzle when no vacuum is applied to any of the vacuum control motors. This is done to prevent a situation where defrost cannot be obtained due to a system vacuum leak.

Air enters the passenger compartment from the:

- instrument panel A/C register (19893).
- heater outlet floor duct (18C433).
- windshield defroster hose nozzle (18490).
- side window demisters.

Passenger compartment air is exhausted from the vehicle through open windows or body air vents.

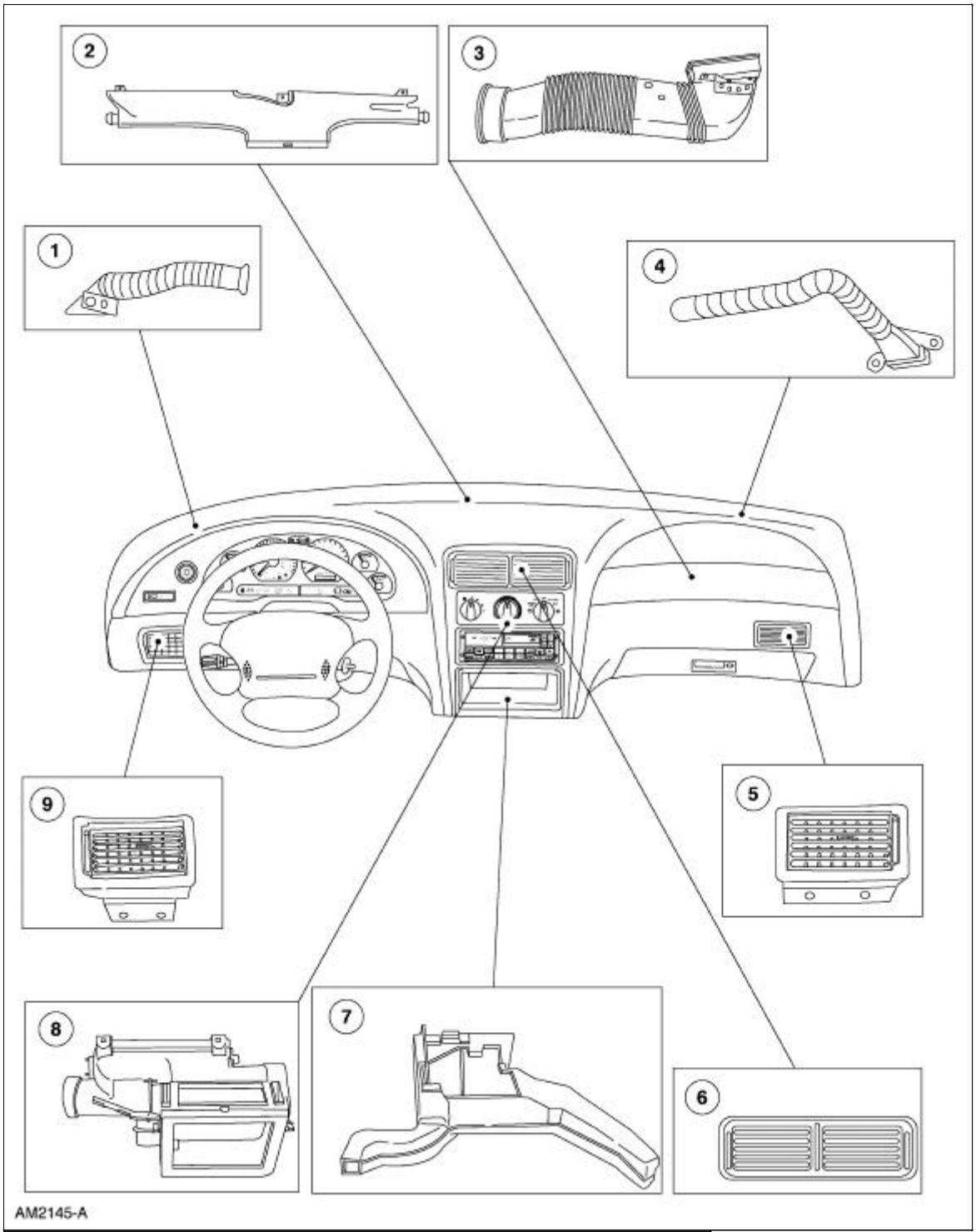
Instrument Panel Registers

There are A/C registers on the left and right sides of the instrument panel and in the center instrument panel finish panel.

The LH and RH A/C registers are only serviceable as assemblies.

The center A/C registers are not serviceable as assemblies. The registers are installed with the instrument panel center finish panel assembly.

Component Locations



Item	Part Number	Description
1	19E630	LH demister nozzle duct
2	18490	Defroster duct
3	19B680	A/C evaporator register duct—(RH)
4	19E630	RH demister nozzle duct
5	19893	A/C evaporator register —(RH)
6	19893	A/C evaporator register —(center)
7	18C433	Floor duct
8	18471	Heater air plenum chamber

9	19893	A/C evaporator register —(LH)

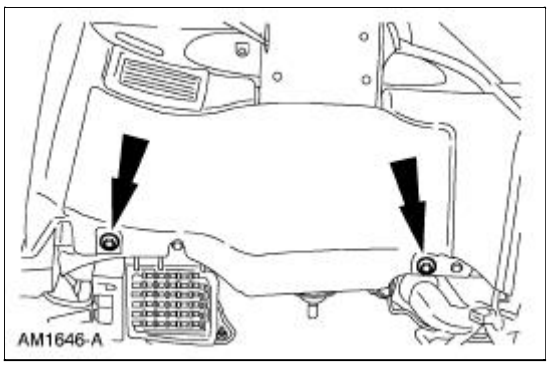
Air Distribution

For additional information, refer to Section 412-00 .

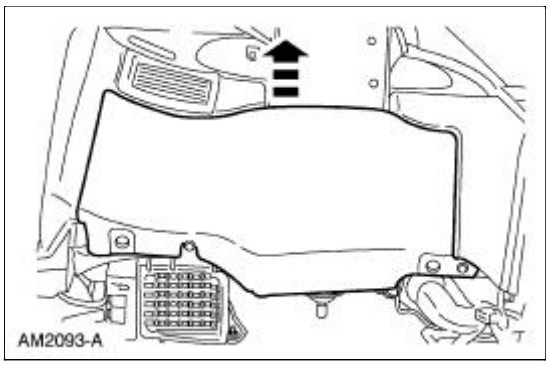
Register —LH

Removal

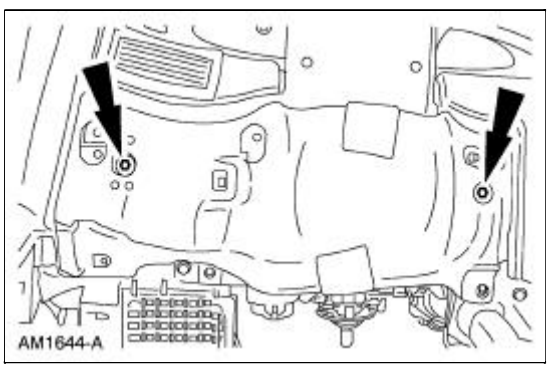
1. Remove the instrument panel steering column cover bolts.



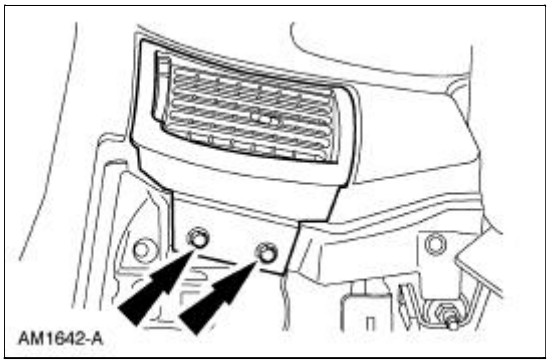
2. Unsnap and remove the instrument panel steering column cover.



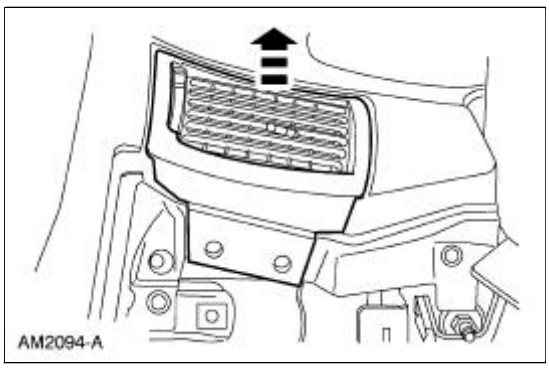
3. Remove the bolts and the steering column reinforcement.



4. Remove the screws.

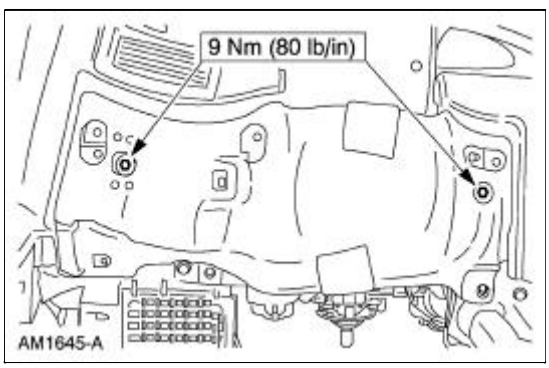


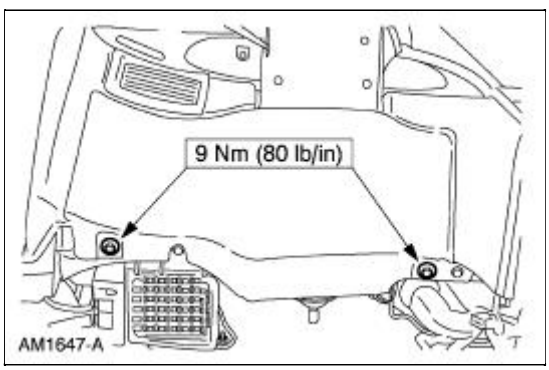
5. Remove the register.



Installation

1. To install, reverse the removal procedure.





Register —Center

Removal and Installation

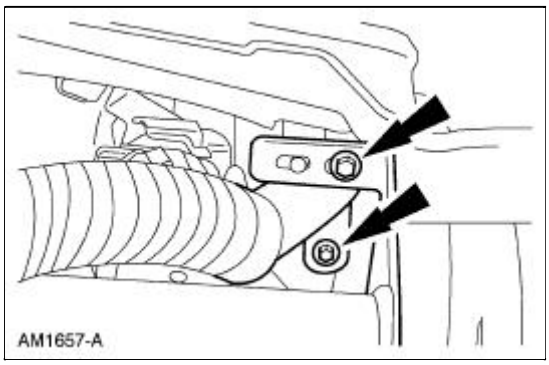
NOTE: The center register is incorporated into the instrument panel center finish panel.

For additional information, refer to Section 501-12 .

Nozzle —LH Demister and Hose

Removal

1. Remove the instrument panel. For additional information, refer to Section 501-12 .
2. Remove the screws.



3. Remove the hose and the nozzle from the instrument panel.

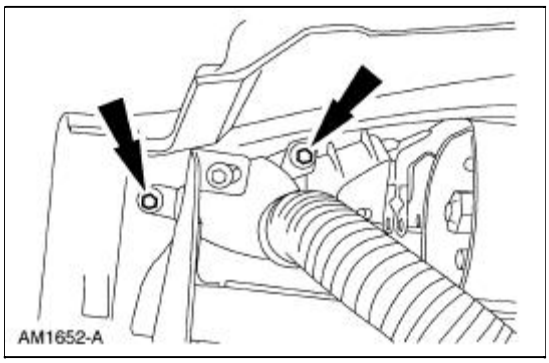
Installation

1. To install, reverse the removal procedure.

Nozzle —RH Demister and Hose

Removal

1. Remove the instrument panel. For additional information, refer to Section 501-12 .
2. Remove the screws.



3. Remove the hose and the nozzle from the instrument panel.

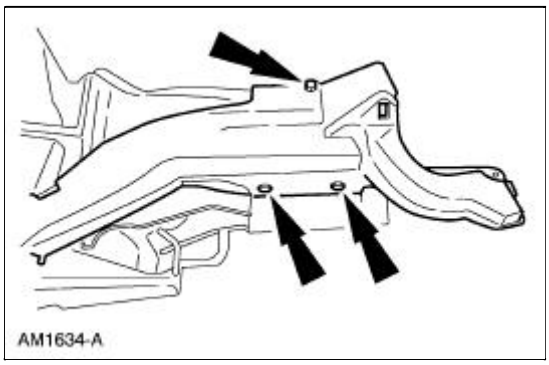
Installation

1. To install, reverse the removal procedure.

Duct —Floor

Removal

1. Remove the evaporator core housing. For additional information, refer to Section 412-02 .
2. Remove the screws and remove the heater outlet floor duct.



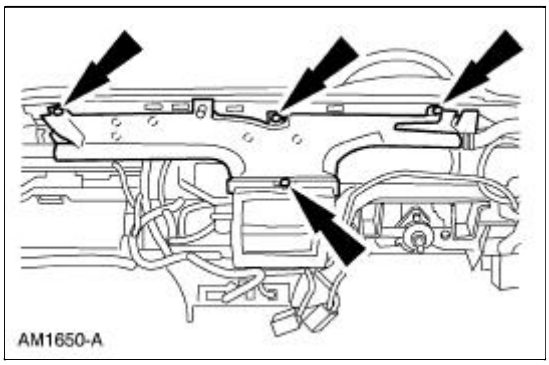
Installation

1. To install, reverse the removal procedure.

Duct —Defroster

Removal

1. Remove the instrument panel. For additional information, refer to Section 501-12 .
2. Remove the screws and remove the defroster duct.



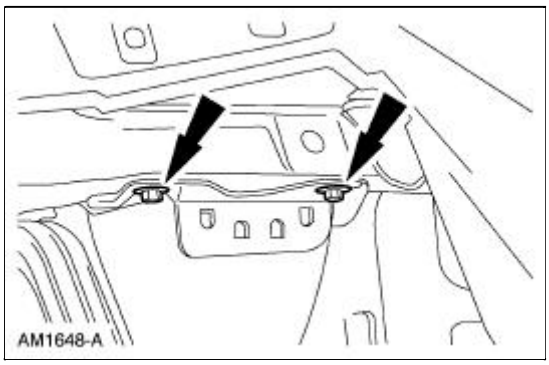
Installation

1. To install, reverse the removal procedure.

Duct —RH Instrument Panel Register

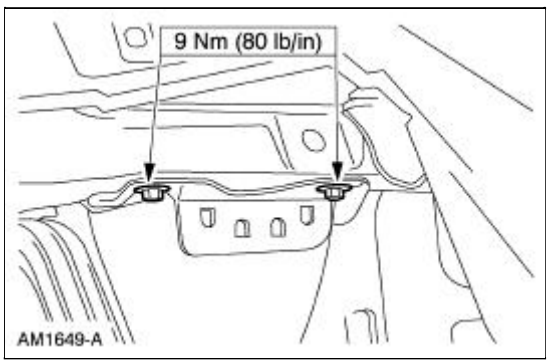
Removal

1. Remove the instrument panel. For additional information, refer to Section 501-12 .
2. Remove the screws and remove the duct.



Installation

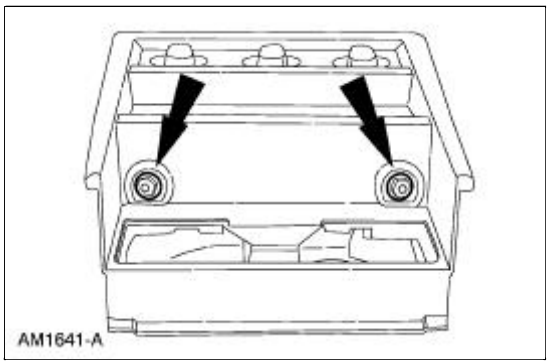
1. To install, reverse the removal procedure.



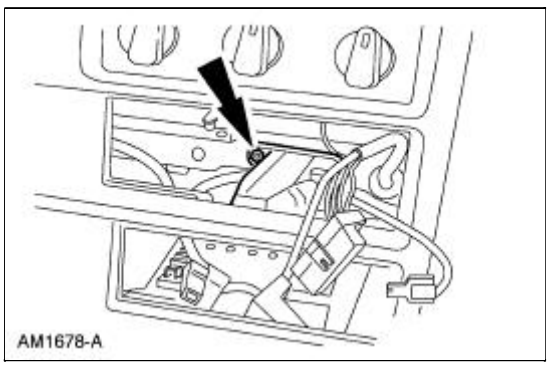
Plenum Chamber

Removal

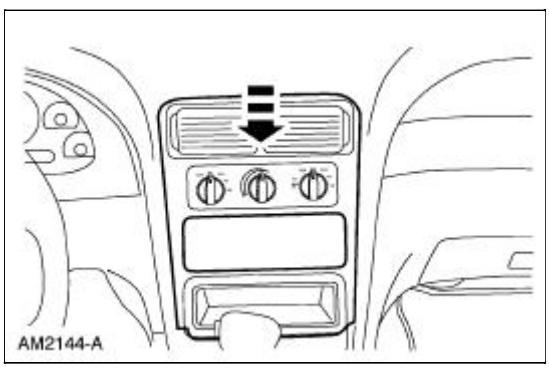
1. Remove the instrument panel. For additional information, refer to Section 501-12 .
2. Remove the audio unit. For additional information, refer to Section 415-01 .
3. If equipped, remove the CD player. For additional information, refer to Section 415-01 .
4. Remove the instrument panel center finish panel screws.



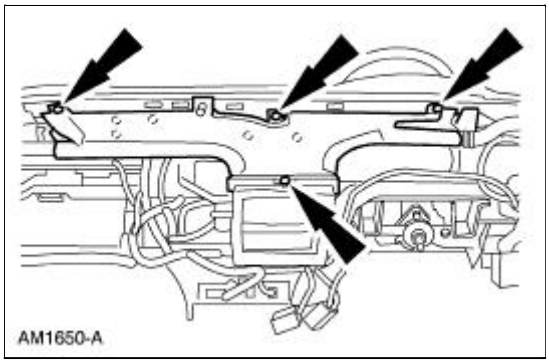
5. Remove the instrument panel center finish panel screw.



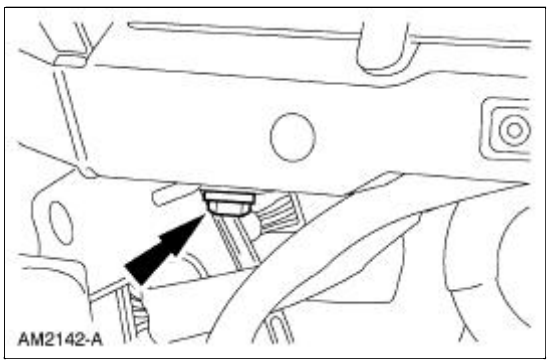
6. Unsnap and remove the instrument panel center finish panel.



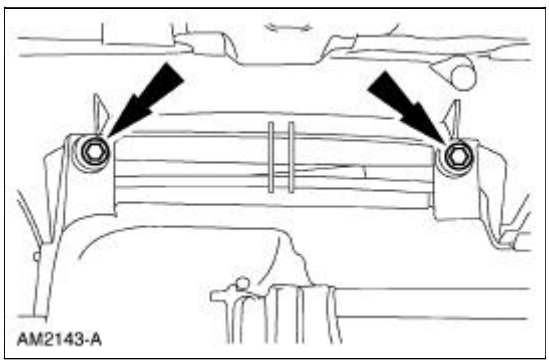
7. Remove the screws and remove the defroster duct.



8. Remove the screw.



9. Remove the screws and remove the plenum chamber.



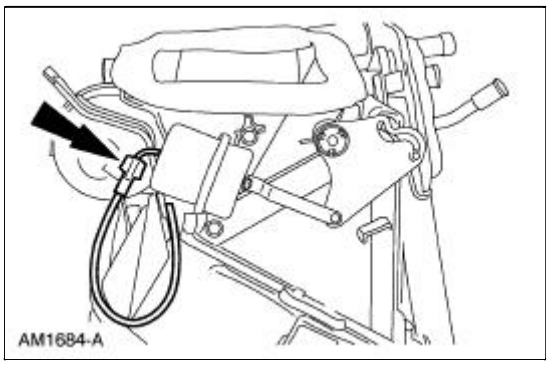
Installation

1. To install, reverse the removal procedure.

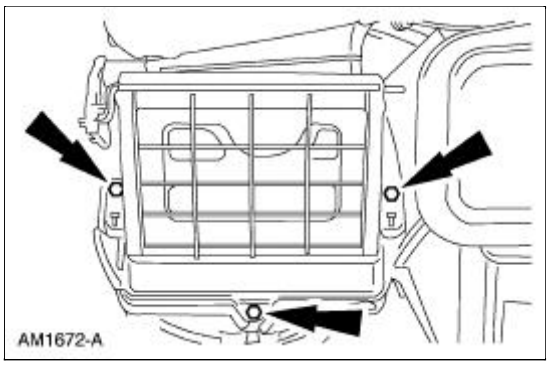
Door —Air Inlet Duct

Removal

1. Remove the evaporator core housing. For additional information, refer to Section 412-02 .
2. Disconnect the vacuum line.



3. Remove the screws and remove the duct.



Installation

1. To install, reverse the removal procedure.

General Specifications

Item	Specification
Lubricant	
MERPOL®	ESE-M99B144-B
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B

Torque Specifications

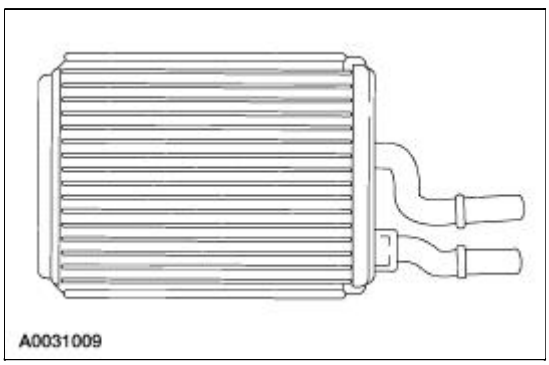
Description	Nm	lb-in
Interior evaporator core housing bracket nut and bolts	8	71

Heating and Defrosting

The heating and defrosting system has the following features:

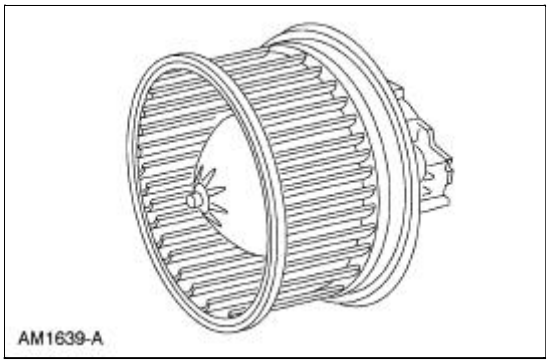
- Controls the temperature and, during A/C operation, reduces the relative humidity of the air inside the vehicle.
- Delivers heated or cooled air to maintain the vehicle interior temperature and comfort level.
- Controls the A/C blower motor speed.
- Cooling or heating can be adjusted to maintain the desired temperature.
- System uses a reheat method to provide conditioned air to the passenger compartment.
- The blower motor (19805) draws outside air through the air inlet duct from just below the windshield during all system operations except for MAX A/C cooling (when recirculated air is used).
- All airflow from the blower motor passes through the A/C evaporator core (19860).
- The temperature is then regulated by reheating a portion of the air and blending it with the remaining cool air to the desired temperature.
- The temperature blending is varied by the air temperature control door, which regulates the amount of air that flows through and around the heater core (18476), where it is then mixed and distributed.

Heater Core



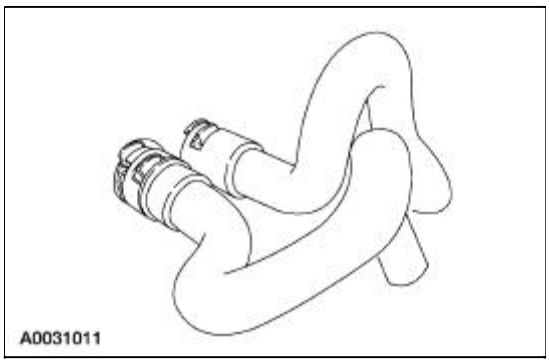
The heater core (18476) consists of fins and tubes arranged to extract heat from the engine coolant and transfer it to air passing through the heater core.

Blower Motor



The A/C blower motor (19805) pulls air from the air inlet and forces it into the plenum assembly where it is mixed and distributed.

Heater Hoses



NOTE: The heater water hoses connect to the heater core using quick disconnect couplers. The couplers are an integral part of the hose assemblies and cannot be separately serviced.

The heater water hoses (18472) provide a flexible connection between the engine and cooling system allowing hot water to travel from the engine to the heater core.

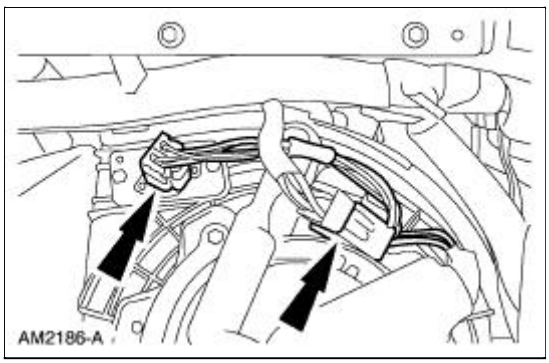
Heating and Defrosting

Refer to Section 412-00 .

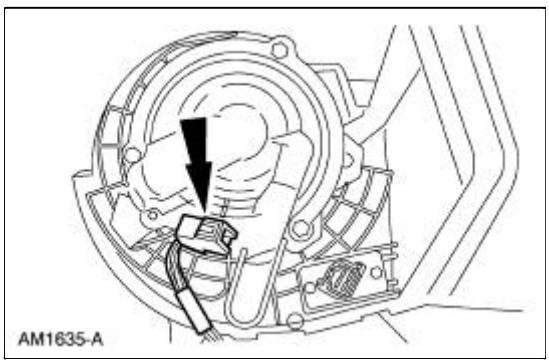
Blower Motor

Removal

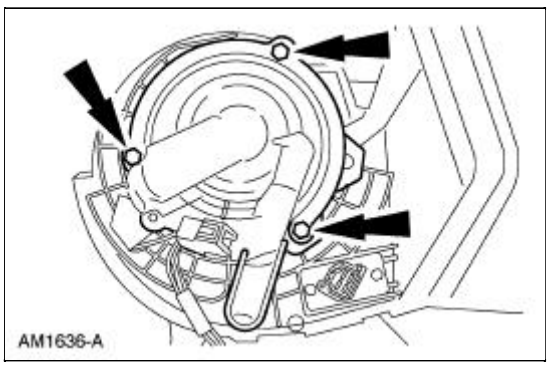
1. Disconnect the jumper wire.



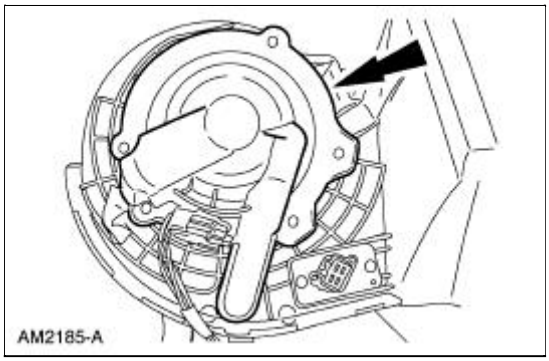
2. Disconnect the main harness.



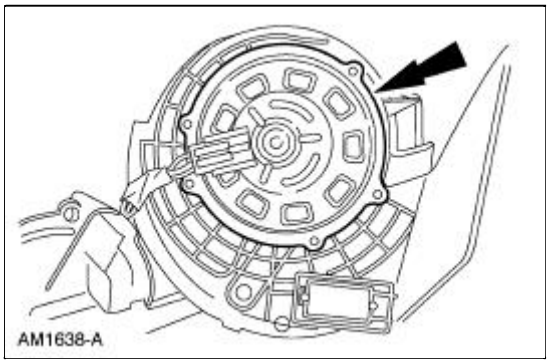
3. Remove the screws.



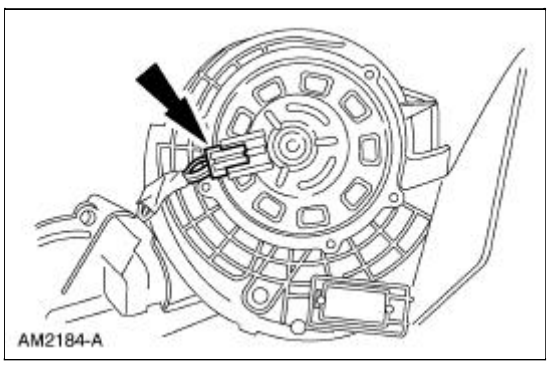
4. Separate the cover from the motor.



5. Separate the motor from the housing.



6. Disconnect the jumper from the motor.
    - Remove the blower motor.



Installation

1. To install, reverse the removal procedure.

Evaporator Core Housing

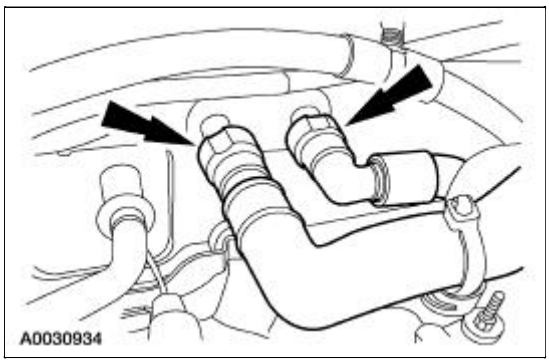
Material

Item	Specification
PAG Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B
MERPOL® NA	ESE-M99B144-B

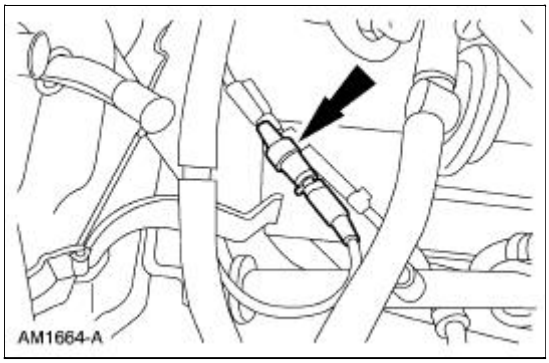
Removal

NOTE: The evaporator core is not separately serviceable, it is serviced only with the evaporator core housing assembly.

1. Disconnect the battery ground cable.
2. Recover the refrigerant. For additional information, refer to Section 412-00 .
3. Drain the cooling system. For additional information, refer to Section 303-03A or Section 303-03B .
4. Remove the instrument panel. For additional information, refer to Section 501-12 .
5. Disconnect the heater hose couplings from the heater core. For additional information, refer to Section 412-00 .

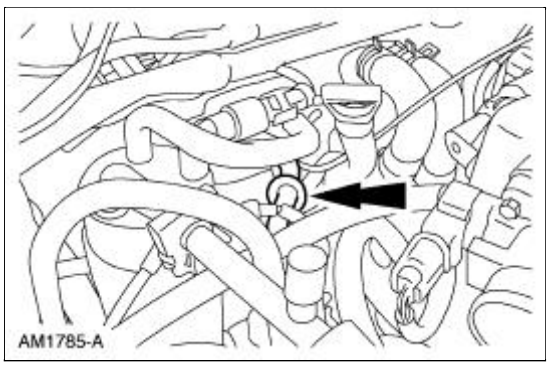


6. Disconnect the vacuum connector.

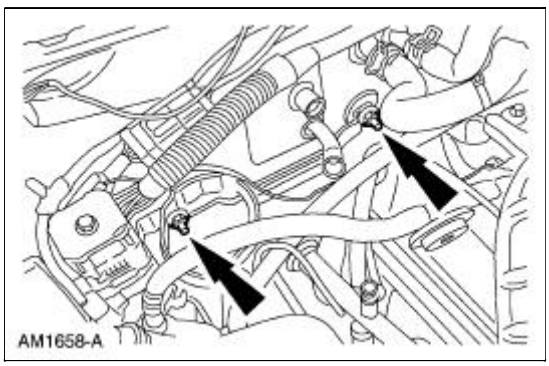


7. Remove the suction accumulator/drier. For additional information, refer to Section 412-03 .

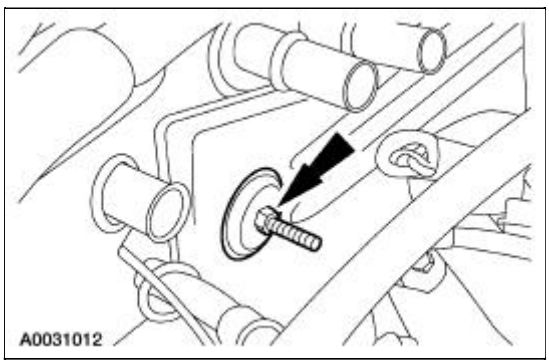
8. Disconnect the A/C liquid line.
    - Discard the O-ring seals.



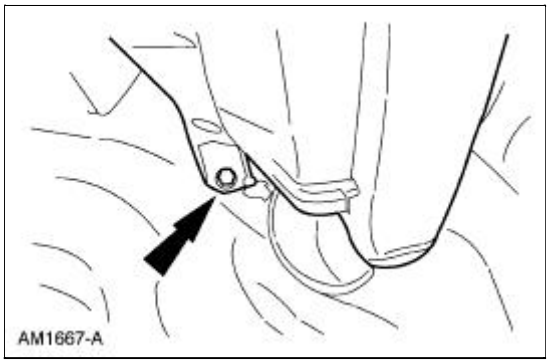
9. Remove the evaporator core housing nuts.



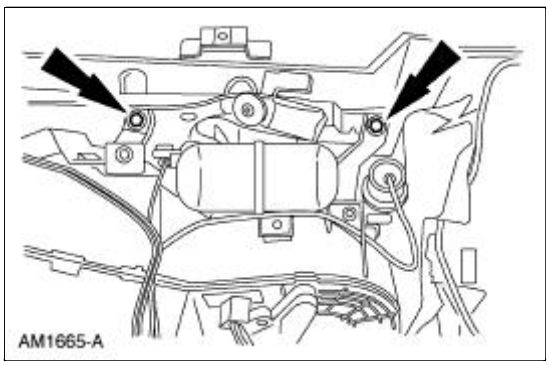
10. Remove the nut.



11. Remove the screw.



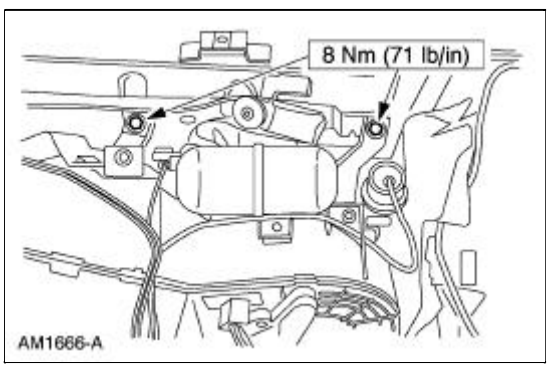
12. Remove the interior evaporator core housing bolts.



13. Remove the evaporator core housing.

Installation

1. To install, reverse the removal procedure.
    - Lubricate the coolant hoses with coolant hose lubricant or plain water only, if needed.
    - Install new O-ring seals lubricated with PAG oil.



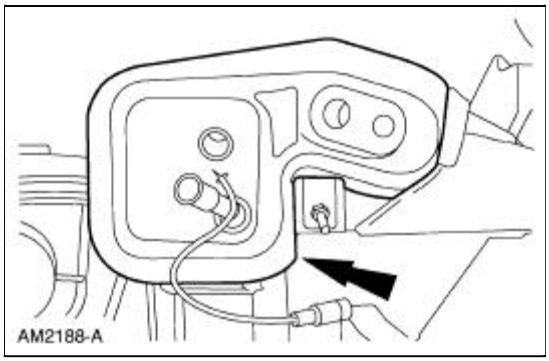
Heater Core

Removal

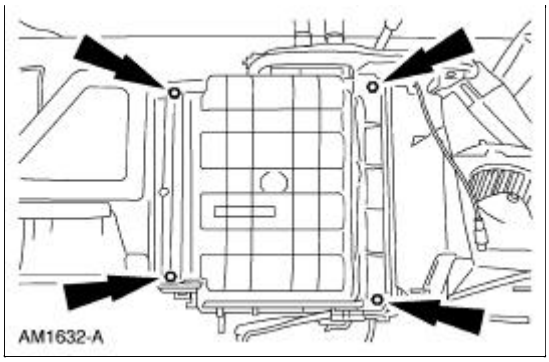
NOTE: If a heater core leak is suspected, the heater core must be pressure leak tested before it is removed from the vehicle. For additional information, refer to Section 412-00 .

1. Remove the evaporator core housing. For additional information, refer to Evaporator Core Housing in this section.

2. Remove the foam weather seal.



3. Remove the screws and remove the heater core cover.



4. Remove the heater core.

Installation

1. **NOTE:** Be sure to install a new oval foam weather seal around the heater core inlet and outlet tubes.

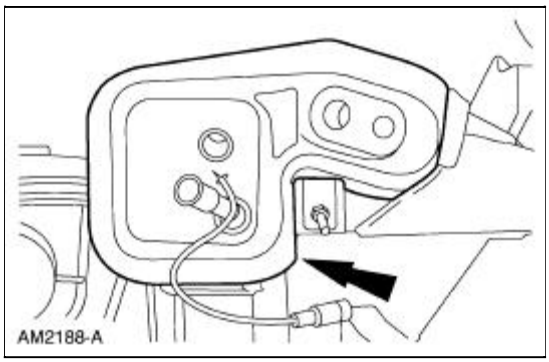
   To install, reverse the removal procedure.

Evaporator Core Housing

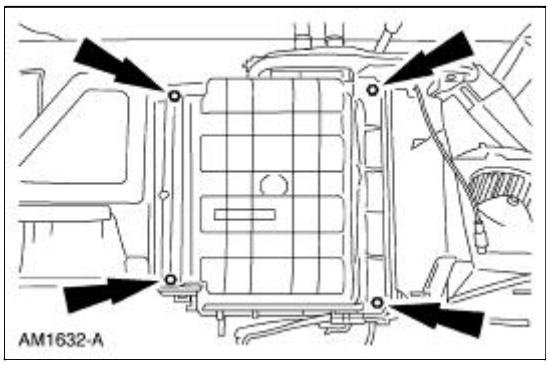
Disassembly

1. Remove the evaporator core housing. For additional information, refer to Evaporator Core Housing in this section.

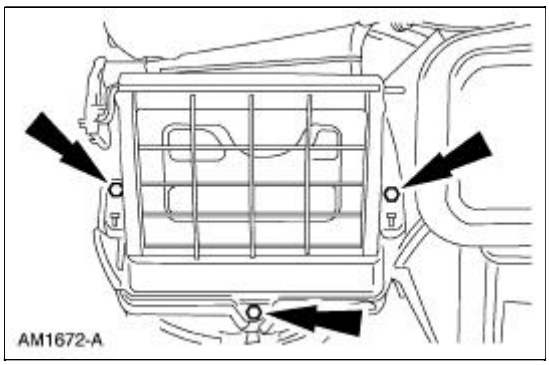
2. Remove the foam weather seal.



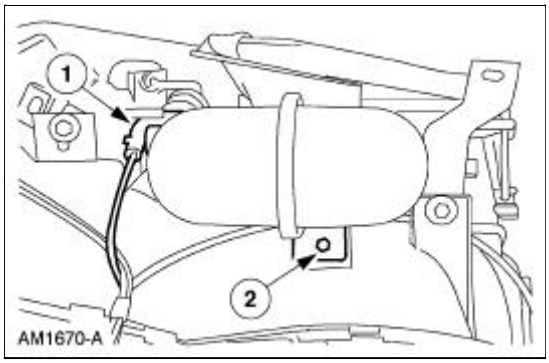
3. Remove the screws and remove the heater core.



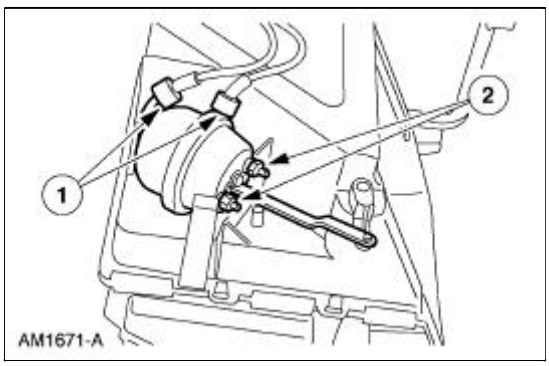
4. Remove the screws and remove the A/C recirculating air duct.



5. Remove the vacuum reservoir.
    1. Disconnect the vacuum line.
    2. Remove the screw.

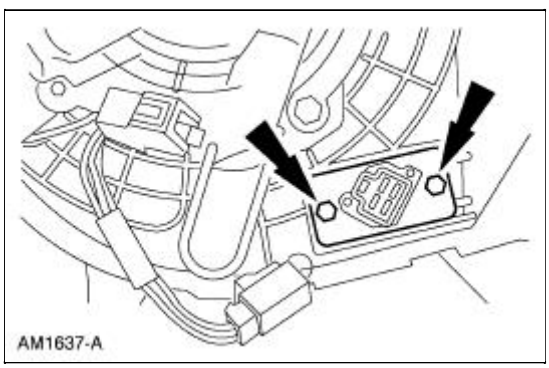


6. Remove the heater air damper door motor.
    1. Disconnect the vacuum lines.
    2. Loosen the nuts and unclip the motor.

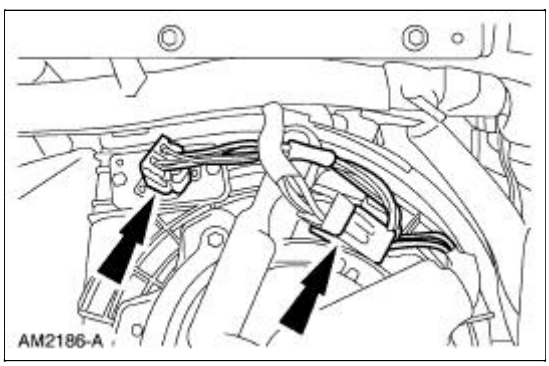


7. Release the vacuum harness from the housing.

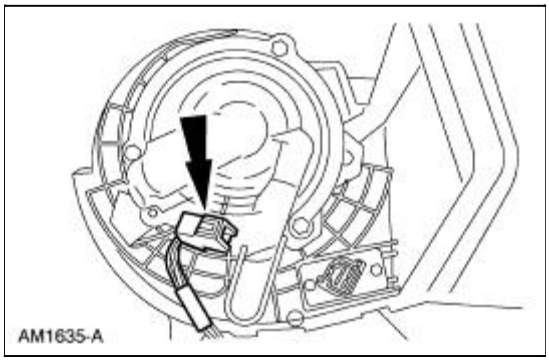
8. Remove the screws and remove the resistor.



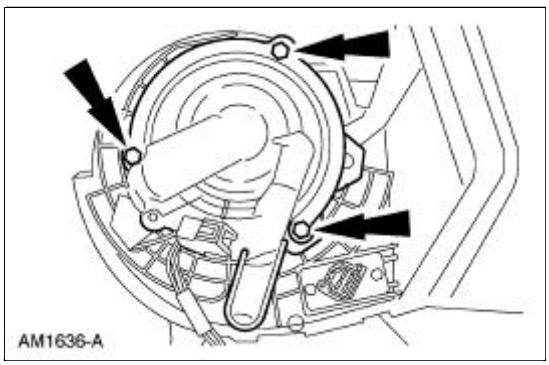
9. Disconnect the jumper wire.



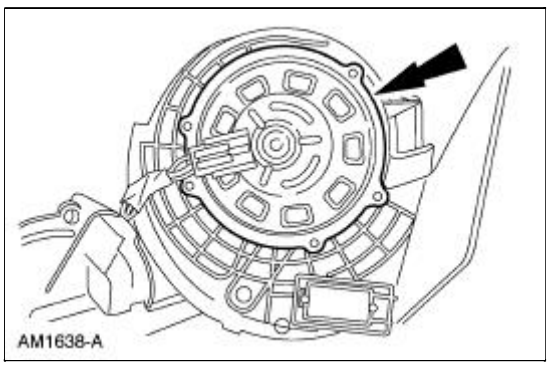
10. Disconnect the main harness.



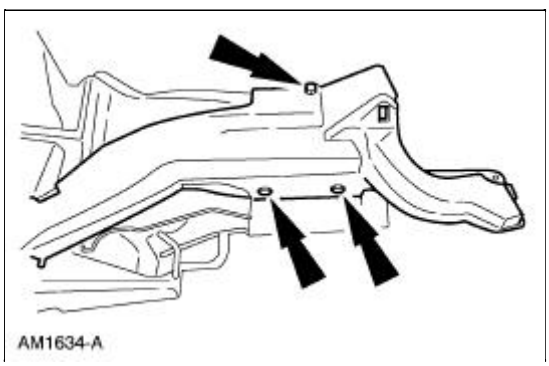
11. Remove the screws.



12. Remove the blower motor.



13. Remove the screws and remove the duct.



14. Remove the mounting brackets.

Assembly

1. To assemble, reverse the disassembly procedure.

General Specifications

Item	Specification
Lubricant	
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (MC YN-12-C)	WSH-M1C231-B

Torque Specifications

Description	Nm	lb-ft	lb-in
A/C compressor mounting bolts	25	18	—
A/C manifold retaining bolt	20	15	—
3.8L engine A/C compressor mounting bracket bolts	47	35	—
3.8L engine A/C compressor mounting bracket nut	25	18	—
A/C compressor clutch retaining bolt	13	10	—
Suction accumulator/drier clamp screw	8	—	71
Coolant bottle bolts	10	—	89
Peanut fittings	8	—	71
Radiator bracket bolts	9	—	81
Condenser core bracket bolts	5	—	44
A/C muffler bracket nut	25	18	—

Air Conditioning

The A/C refrigerant system is a clutch cycling orifice tube type. The system components are:

- A/C compressor (19703)
- A/C clutch (2884)
- A/C condenser core (19712)
- A/C evaporator core (19860)
- suction accumulator (19C836)
- connecting refrigerant lines

The refrigeration system operation is controlled by the:

- A/C evaporator core orifice (19D990).
- A/C cycling switch (19E561).
- A/C compressor pressure relief valve (19D644).
- Refrigerant containment switch (3.8L) (19D594).
- Dual-function pressure switch (4.6L) (19D594).

The refrigerant system incorporates an A/C compressor controlled by an A/C cycling switch.

The A/C cycling switch senses A/C evaporator core pressure to control A/C compressor operation.

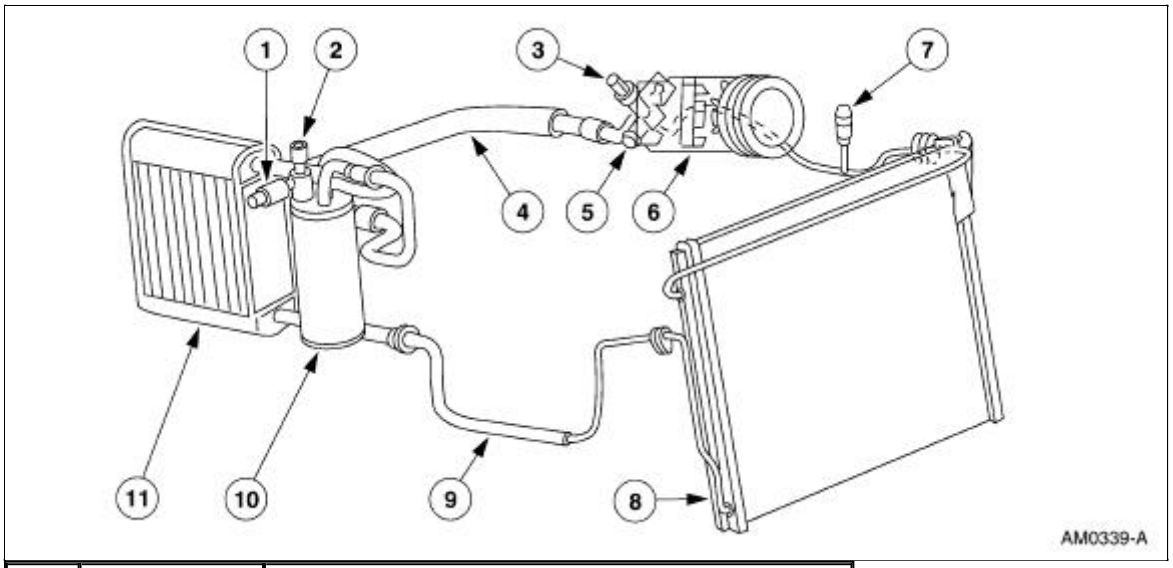
An A/C compressor pressure relief valve is installed in the A/C manifold and tube (19D734) to protect the refrigerant system against excessively high refrigerant pressures.

An evaporator core orifice is installed in the A/C evaporator core inlet tube to meter the liquid refrigerant into the A/C evaporator core.

A refrigerant containment switch is installed on 3.8L vehicles to cut-off A/C compressor operation in the event of abnormally high refrigerant system pressure.

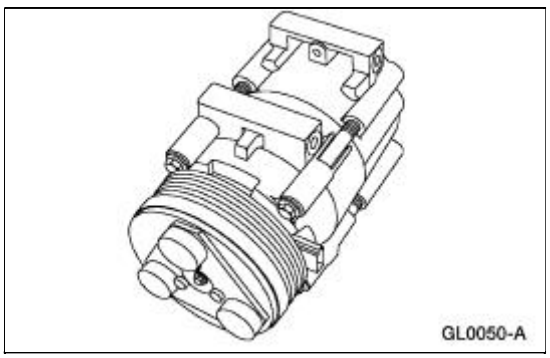
A dual-function pressure switch is used on 4.6L vehicles for cooling fan control, and to cut-off A/C compressor operation in the event of abnormally high refrigerant system pressure.

Refrigeration System Components



Item	Part Number	Description
1	19E561	A/C cycling switch
2	19D701	A/C charge port valve (low side)
3	19D594	Refrigerant containment switch (3.8L vehicles)
3	19D594	Dual-function pressure switch (4.6L vehicles)
4	19D734	A/C manifold and tube
5	19D644	A/C compressor pressure relief valve
6	19703	A/C compressor
7	19D701	A/C charge port valve (high side)
8	19712	A/C condenser core
9	19835	Condenser to evaporator tube
10	19C836	Suction accumulator
11	—	A/C evaporator core (part of 19850 assembly)

A/C Compressor and Clutch Assembly

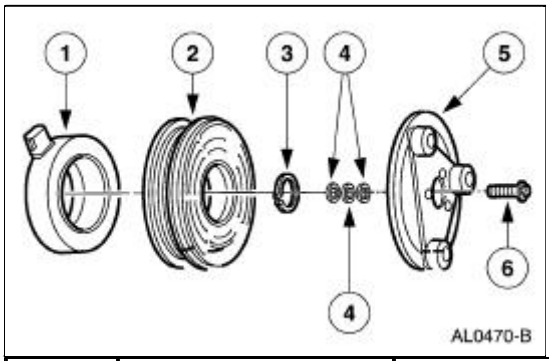


NOTE: Internal A/C compressor components are not serviced separately. The FS-10 A/C compressor is serviced only as an assembly. The A/C clutch pulley, A/C clutch field coil (19D798) and the shaft seal are serviceable.

The FS-10 A/C compressor has the following characteristics:

- A ten-cylinder swashplate design utilizing the tangential design mount.

- A one-piece lip-type seal (installed from the front of the A/C compressor) is used to seal it at the shaft opening in the assembly.
- Five double-acting pistons operate within the cylinder assembly. The pistons are actuated by a swashplate that converts the rotating action of the shaft to a reciprocating force.
- Reed-type discharge valves are located between the cylinder assembly and the head at each end of the A/C compressor.
- The A/C compressor uses PAG oil, or equivalent. This oil contains special additives required for the A/C compressor.
- The A/C compressor oil from vehicles equipped with an FS-10 A/C compressor may have some dark colored streaking while maintaining a normal oil viscosity. This is normal for the A/C compressor and is caused by break-in wear of the piston rings.

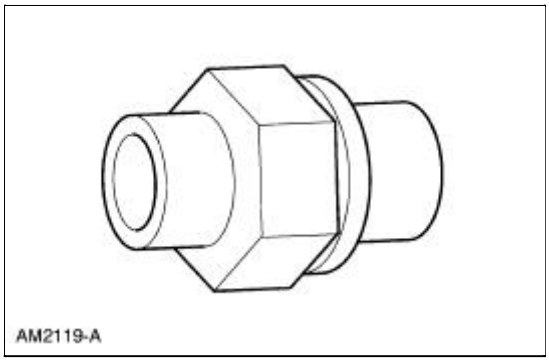


Item	Part Number	Description
1	19D798	A/C clutch field coil
2	19D784	A/C clutch pulley
3	N805338-S2	Pulley snap ring
4	19D648	A/C clutch hub spacer
5	19D786	Disk and hub assembly
6	N805332-S2	A/C clutch bolt

The magnetic A/C clutch has the following characteristics:

- It drives the compressor shaft.
- When the battery positive voltage (B+) is applied to the A/C clutch field coil, the clutch plate and hub assembly is drawn toward the A/C clutch pulley.
- The magnetic force locks the clutch plate and hub assembly and the A/C clutch pulley together as one unit, causing the compressor shaft to rotate.
- When (B+) is removed from the A/C clutch field coil, springs in the clutch plate and hub assembly move the clutch plate away from the A/C clutch pulley.

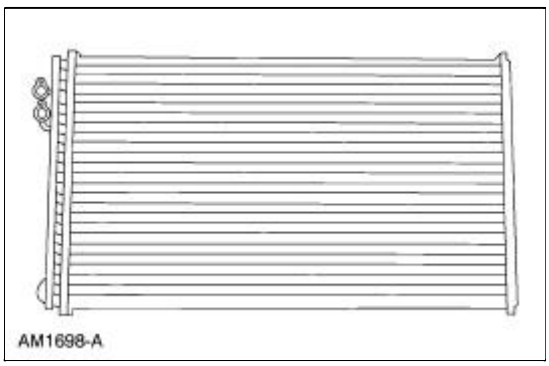
A/C Compressor Pressure Relief Valve



An A/C compressor pressure relief valve is incorporated into the compressor A/C manifold and tube to:

- relieve unusually high refrigerant system discharge pressure buildups. For specifications regarding operating pressure(s), refer to Section 412-00 .
- prevent damage to the A/C compressor and other system components.
- avoid total refrigerant loss by closing after the excessive pressure has been relieved.

A/C Condenser Core



The A/C condenser core has the following characteristics:

- It is an aluminum fin and tube design heat exchanger located in front of the vehicle radiator (8005).
- It cools compressed refrigerant gas by allowing air to pass over fins and tubes to extract heat and by condensing gas to liquid refrigerant as it is cooled.

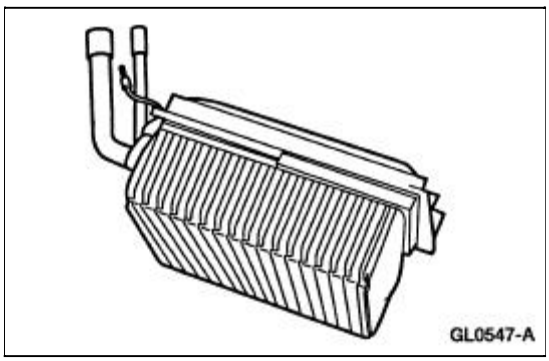
Refrigerant Lines

The condenser to evaporator tube (19835) contains the high pressure liquid refrigerant upstream of the evaporator core orifice.

The A/C manifold and tube (19D734) is attached to the A/C compressor, is sealed with O-ring seals, and has the following features:

- The upstream side contains low pressure refrigerant gas.
- The downstream side contains high pressure refrigerant gas and a fitting used to mount a serviceable high pressure A/C charge port valve.
- The downstream side also contains a fitting used to mount the refrigerant containment switch (3.8L) or dual-function pressure switch (4.6L). A long-travel Schrader-type valve stem core is installed in the fitting so that the switch can be removed without discharging the A/C system.

A/C Evaporator Core



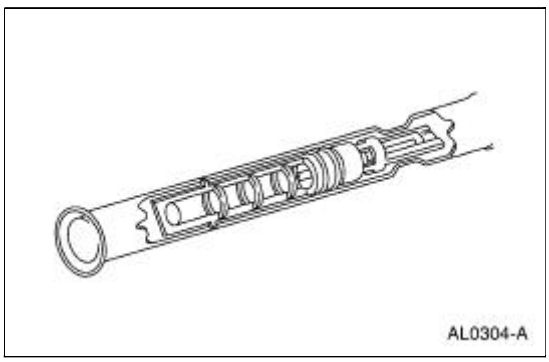
NOTE: The evaporator core is not separately serviceable, it is serviced only with the evaporator core housing assembly.

NOTE: Installation of a new suction accumulator is not required when repairing the air conditioning system except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator.

The A/C evaporator core is the plate/fin type with a unique refrigerant flow path.

- A mixture of refrigerant and oil enters the bottom of the A/C evaporator core through the A/C evaporator core inlet tube and moves out of the A/C evaporator core through the A/C evaporator core outlet tube.
- This flow pattern accelerates the flow of refrigerant and oil through the A/C evaporator core.

Evaporator Core Orifice



NOTE: The evaporator core orifice is an integral part of the condenser to evaporator line and should be installed as an assembly with the line.

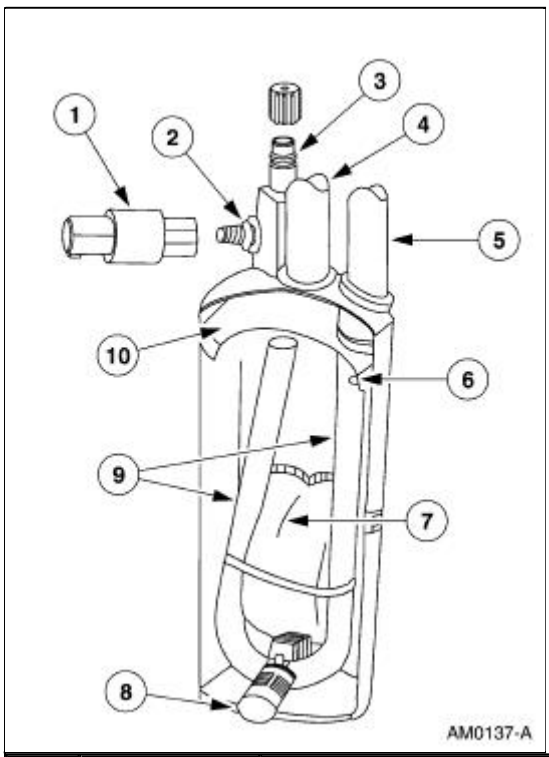
NOTE: A new evaporator core orifice should be installed whenever a new A/C compressor is installed.

The evaporator core orifice has the following characteristics:

- It is located in the A/C condenser to evaporator line.
- It has filter screens located on the inlet and outlet ends of the tube body.
- The inlet filter screen acts as a strainer for the liquid refrigerant flowing through the evaporator core orifice.
- O-ring seals on the evaporator core orifice prevent the high-pressure liquid refrigerant from bypassing the evaporator core orifice.

- Adjustment or repair cannot be made to the evaporator core orifice assembly. A new evaporator core orifice must be installed as a unit.

Suction Accumulator



Item	Part Number	Description
1	19E561	A/C cycling switch
2	—	O-ring seal (part of 19C836)
3	19D701	Low pressure service gauge port valve
4	—	Inlet from A/C evaporator core (part of 19C836)
5	—	Outlet to A/C compressor (part of 19C836)
6	—	Anti-siphon hole (part of 19C836)
7	—	Desiccant bag (part of 19C836)
8	—	Oil return orifice filter (part of 19C836)
9	—	Vapor return tube (part of 19C836)
10	—	Suction accumulator dome (part of 19C836)

NOTE: Installation of a new suction accumulator is not required when repairing the air conditioning system except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator.

In addition to the preceding condition, a new suction accumulator should be installed if one of the following conditions exist:

- The suction accumulator is perforated.
- The refrigerant system has been opened to the atmosphere for a period of time longer than required to make a minor repair.
- There is evidence of moisture in the system such as internal corrosion of metal refrigerant lines or the refrigerant oil is thick and dark.

The suction accumulator (19C836) is mounted to the A/C accumulator bracket (19D606) to the right of the vehicle centerline. The inlet tube of the suction accumulator attaches directly to the A/C evaporator core outlet tube and the outlet tube attaches to the A/C manifold and tube.

After entering the inlet of the suction accumulator, the heavier oil-laden refrigerant contacts an internally mounted dome (which serves as an umbrella) and drips down onto the bottom of the canister.

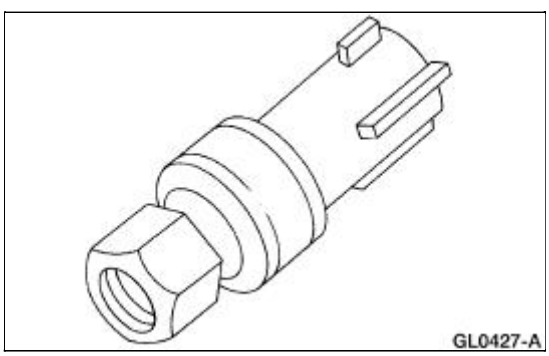
- A small diameter oil bleed hole, in the bottom of the vapor return tube, allows the accumulated heavier liquid refrigerant and oil mixture to reenter the compressor suction line at a controlled rate.
- As the heavier mixture passes through the small diameter liquid bleed hole, it has a second chance to vaporize and recirculate through the A/C compressor without causing compressor damage due to slugging.
- A fine mesh screened filter fits tightly around the bottom of the vapor return tube to filter out refrigerant system contaminant particles.
- A desiccant bag is mounted inside the canister to absorb any moisture which may be in the refrigerant system.
- A fitting located on the top of the suction accumulator is used to attach the A/C cycling switch. A long-travel Schrader-type valve stem core is installed in the fitting so that the A/C cycling switch can be removed without discharging the A/C system.

A/C Cycling Switch

The A/C cycling switch is mounted on a Schrader-type valve fitting on the top of the suction accumulator.

- A valve depressor, located inside the threaded end of the A/C cycling switch, presses in on the Schrader valve stem.
- This allows the suction pressure inside the suction accumulator to control the operation of the A/C cycling switch.
- The electrical switch contacts open when the suction pressure drops. The contacts close when the suction pressure rises. For specifications regarding operating pressure(s), refer to Section 412-00 .
- The A/C cycling switch will control the A/C evaporator core pressure at a point where the plate/fin surface temperature will be maintained slightly above freezing.
- This prevents icing of the A/C evaporator core and blockage of air flow.
- It is not necessary to discharge the refrigerant system to remove the A/C cycling switch.

Dual-Function Pressure Switch (4.6L)



The dual-function pressure switch is used to interrupt A/C compressor operation in the event of high

system discharge pressures.

- The dual-function pressure switch is mounted on a Schrader valve-type fitting on the high pressure side of the A/C manifold and tube.
- It is not necessary to discharge the refrigerant system to remove the dual-function pressure switch.
- A valve depressor, located inside the threaded end of the dual-function pressure switch, presses on the Schrader valve stem.
- This allows the dual-function pressure switch to monitor the compressor discharge pressure.
- When the compressor discharge pressure rises, the switch contacts open, disengaging the A/C compressor. When the pressure drops, the contacts close to allow operation of the A/C compressor. For specifications regarding operating pressure(s), refer to Section 412-00 .

The dual-function pressure switch has a second set of electrical contacts used for high-speed cooling fan control.

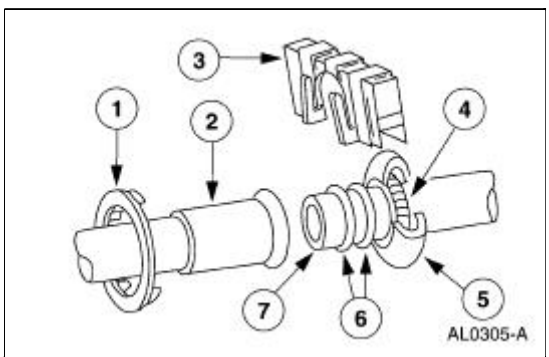
- When the compressor discharge pressure rises, the contacts close and engage the high speed fan control. When the pressure drops, the contacts open and the high speed fan control is disengaged.

Refrigerant Containment Switch (3.8L)

The refrigerant containment switch is used to interrupt A/C compressor operation in the event of high system discharge pressures.

- The refrigerant containment switch is mounted on a Schrader-type valve fitting on the high pressure side of the compressor manifold and tube assembly.
- A valve depressor, located inside the threaded end of the refrigerant containment switch, presses on the Schrader valve stem.
- This allows the refrigerant containment switch to monitor the A/C compressor discharge pressure.
- When the A/C compressor discharge pressure rises, the switch contacts open, disengaging the A/C compressor. When the pressure drops, the contacts close to allow operation of the A/C compressor. For additional information regarding operating pressure(s), refer to Section 412-00 .
- It is not necessary to discharge the refrigerant system to remove the refrigerant containment switch.

Spring Lock Coupling



Item	Part Number	Description
1	—	Plastic indicator ring (part of 19D690)

2	—	Female fitting (part of 19860)
3	19E746	A/C tube lock coupling clip
4	19E576	A/C tube lock coupling spring
5	—	Cage (part of 19D690)
6	—	O-ring seals (part of 19D690)
7	—	Male fitting (part of 19835)

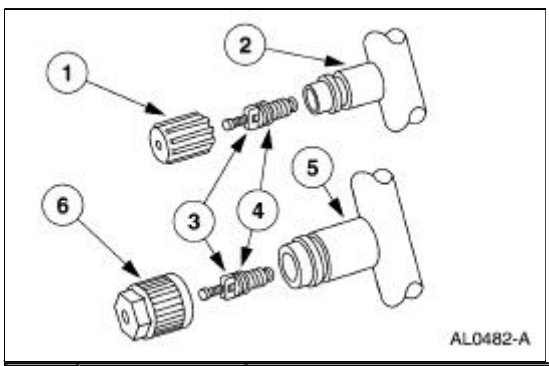
The spring lock coupling is a refrigerant line coupling held together by a garter spring inside a circular cage.

- When the coupling is connected together, the flared end of the female fitting slips behind the garter spring inside the cage of the male fitting.
- The garter spring and cage then prevent the flared end of the female fitting from pulling out of the cage.
- Three O-ring seals are used to seal between the two halves of the A/C condenser core couplings. All other couplings have two O-ring seals.
- Use only the O-ring seals listed in the Ford Master Parts Catalog for the spring lock coupling.
- A plastic indicator ring is used on the spring lock couplings of the A/C evaporator core to indicate, during vehicle assembly, that the coupling is connected. Once the coupling is connected, the indicator ring is no longer necessary but will remain captive by the coupling near the cage opening.
- The indicator ring may also be used during repair operations to indicate connection of the coupling.
- An A/C tube lock coupling clip (19E746) may be used to secure the coupling but is not required.

Service Gauge Port Valves

The high-pressure service gauge port valve is located on the A/C manifold and tube.

The low pressure service gauge port valve is located on the suction accumulator.



Item	Part Number	Description
1	19D702	A/C charging valve cap
2	19D701	Low pressure service gauge port valve (part of 19C836)
3	19D701	Schrader-type valve
4	—	O-ring seal (part of 19D701)
5	19D701	High pressure service gauge port valve (part of

		19D734)
6	19D702	A/C charging valve cap

The fitting is an integral part of the refrigeration line or component.

- Special couplings are required for both the high side and low side service gauge ports.
- A new Schrader-type valve core can be installed if the seal leaks.
- Always install the A/C charging valve cap (19D702) on the service gauge port valves after repairing the refrigerant system.

Air Conditioning

Refer to Section 412-00 .

Air Conditioning (A/C) Compressor —3.8L

Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B

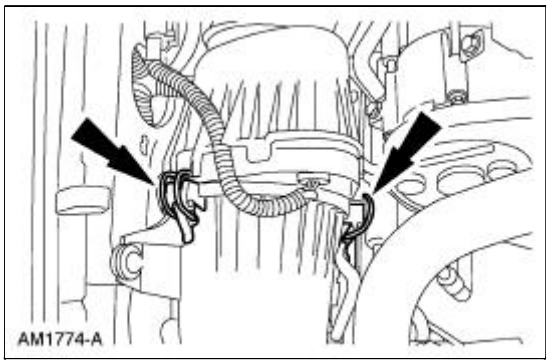
Removal and Installation

CAUTION: If installing a new air conditioning compressor due to an internal failure of the old unit, you must carry out the following procedures to remove contamination from the air conditioning system.

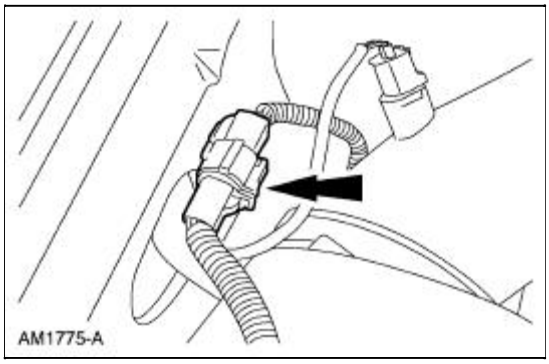
- **If A/C flushing equipment is available, carry out the flushing of the air conditioning system prior to installing a new air conditioning compressor. For additional information, refer to Section 412-00 .**
- **If A/C flushing equipment is not available, carry out filtering of the air conditioning system after a new air conditioning compressor has been installed. For additional information, refer to Section 412-00 .**
- **Install a new evaporator core orifice (19D990), as directed by the A/C flushing or filtering procedure.**
- **Install a new suction accumulator (19C836), as directed by the A/C flushing or filtering procedure.**

NOTE: Installation of a new suction accumulator is not required when repairing the air conditioning system except when there is physical evidence of system contamination from a failed A/C compressor or damage to the suction accumulator.

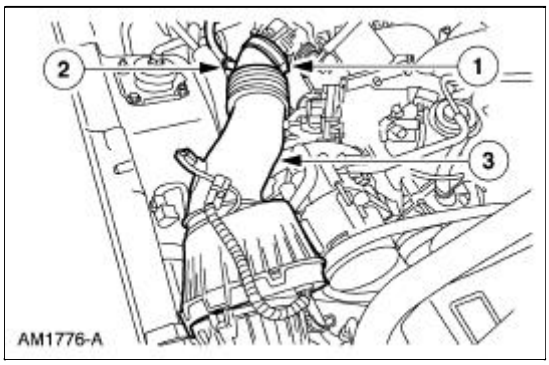
1. If flushing of the air conditioning system has not been performed, recover the refrigerant. For additional information, refer to Section 412-00 .
2. Disconnect the battery. For additional information, refer to Section 414-01
3. Unlatch the air breather.



4. Disconnect the mass airflow (MAF) sensor electrical connector.

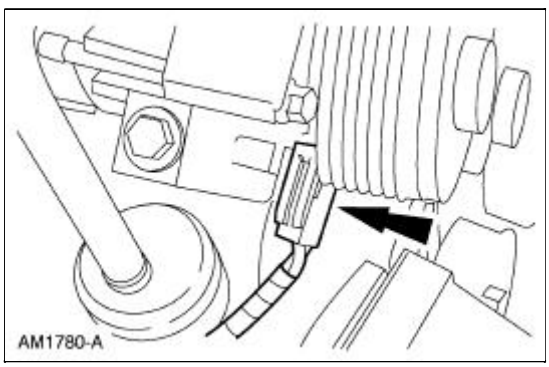


5. Remove the air cleaner outlet tube (9B659).
    1. Loosen the clamp.
    2. Disconnect the crankcase ventilation tube (6758).
    3. Remove the air cleaner outlet tube assembly.

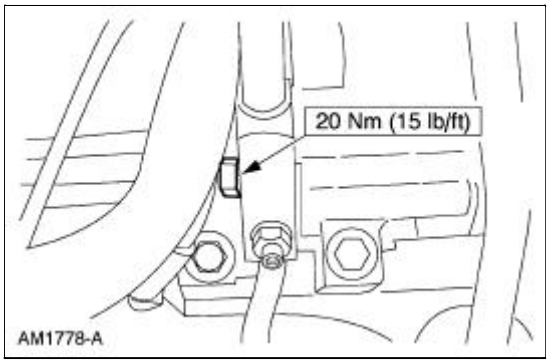


6. Remove the drive belt (8620) from the A/C compressor pulley.

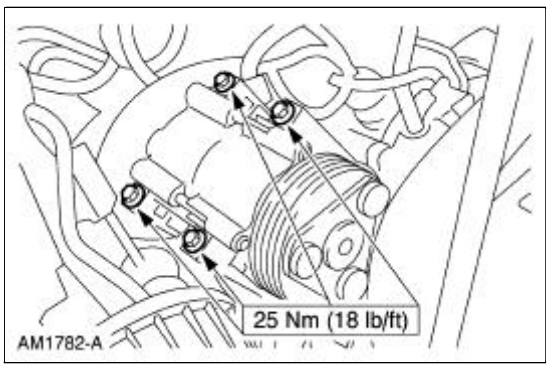
7. Disconnect the electrical compressor clutch connector.



8. Remove the bolt and disconnect the A/C manifold and tube (19D734).
    - Discard the O-ring seals.



9. Remove the bolts and the A/C compressor.



10. To install, reverse the removal procedure.
    - Install new O-ring seals lubricated in clean PAG oil.
    - If filtering of the refrigerant system is not to be performed, lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Section 412-00 .

11. If filtering of the air conditioning system is not to be performed, evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

Air Conditioning (A/C) Compressor —4.6L

Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B

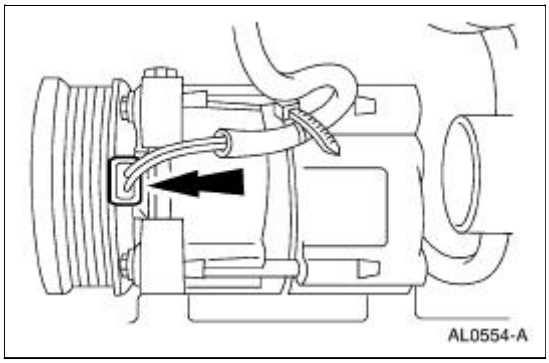
Removal and Installation

CAUTION: If installing a new air conditioning compressor due to an internal failure of the old unit, you must carry out the following procedures to remove contamination from the air conditioning system.

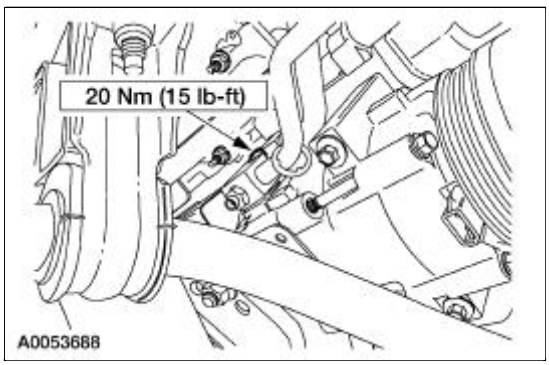
- **If A/C flushing equipment is available, carry out the flushing of the air conditioning system prior to installing a new air conditioning compressor. For additional information, refer to Section 412-00 .**
- **If A/C flushing equipment is not available, carry out filtering of the air conditioning system after a new air conditioning compressor has been installed. For additional information, refer to Section 412-00 .**
- **Install a new evaporator core orifice (19D990), as directed by the A/C flushing or filtering procedure.**
- **Install a new suction accumulator (19C836), as directed by the A/C flushing or filtering procedure.**

NOTE: Installation of a new suction accumulator is not required when repairing the air conditioning system except when there is physical evidence of system contamination from a failed A/C compressor or damage to the suction accumulator.

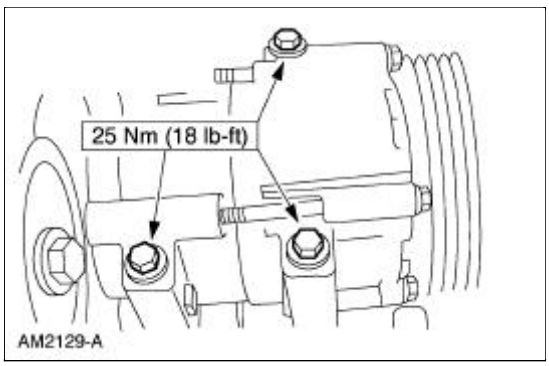
1. If flushing of the air conditioning system has not been performed, recover the refrigerant. For additional information, refer to Section 412-00 .
2. Remove the drive belt from the A/C compressor pulley.
3. Raise the vehicle. For additional information, refer to Section 100-02 .
4. Disconnect the A/C compressor electrical connector.



5. Remove the bolt and detach the manifold and tube assembly.



6. Remove the compressor.
    1. Remove the bolts.
    2. Remove the compressor.



7. To install, reverse the removal procedure.
    - Install new O-ring seals lubricated in clean PAG oil.
    - If filtering of the refrigerant system is not to be performed, lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Section 412-00 .

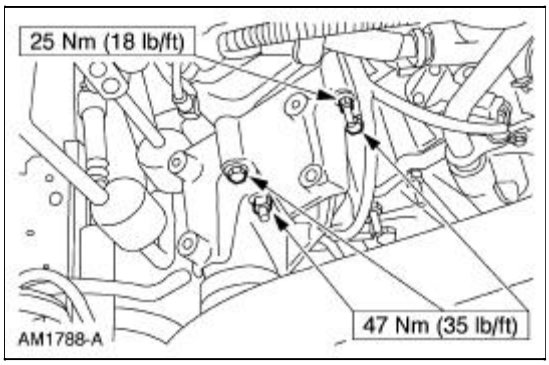
8. If filtering of the refrigerant system is not to be performed, evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

Air Conditioning (A/C) Compressor Bracket —3.8L

Removal and Installation

1. Remove the A/C compressor (19703). For additional information, refer to Air Conditioning (A/C) Compressor—3.8L in this section.

2. Remove the three bolts and one nut.

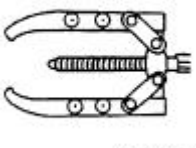
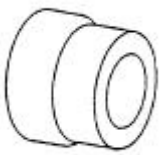
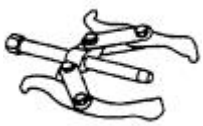
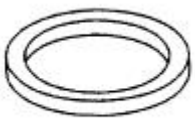


3. Remove the A/C compressor mounting bracket.

4. To install, reverse the removal procedure.

Clutch And Clutch Field Coil

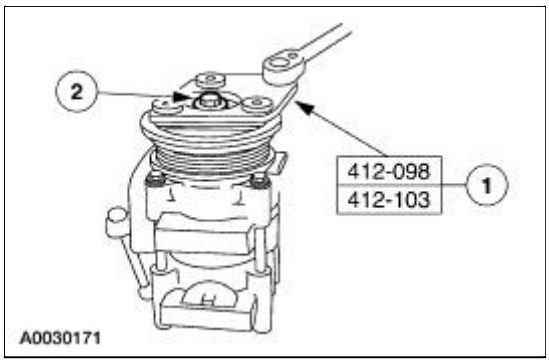
Special Tool(s)

 ST1260-A	2-Jaw Puller 205-D026 (D80L-1002-L) or equivalent
 ST1232-A	Installer, A/C Compressor Coil 412-065 (T89P-19623-EH)
ST1235-A	Holding Fixture, Compressor Clutch (3.8L vehicles) 412-098 (T94P-19703-AH)
ST2584-A	Holding Fixture, Compressor Clutch (4.6L vehicles) 412-103 (T95L-19703-AH)
 ST1220-A	Remover, Differential Bearing 205-116 (T77F-4220-B1)
 ST1234-A	Installer, A/C Compressor Field Coil 412-078 (T91L-19623-CH)
ST1233-A	Remover, A/C Compressor Field Coil 412-067 (T89P-19623-FH)

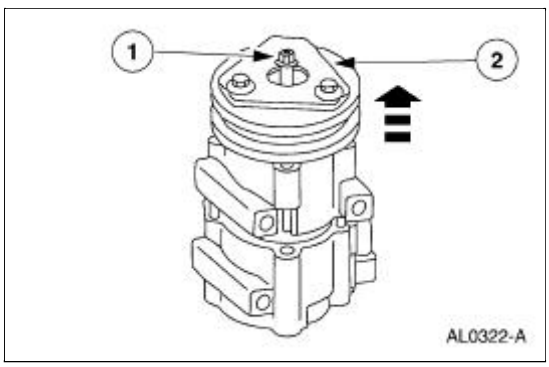
Removal

1. Remove the A/C compressor (19703). For additional information, refer to Air Conditioning (A/C) Compressor—3.8L or Air Conditioning (A/C) Compressor—4.6L in this section.

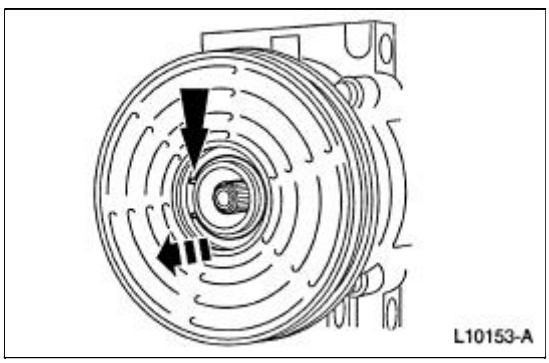
2. Remove the bolt.
    1. Hold the A/C disc and hub assembly (19D786) with the special tool.
    2. Remove the bolt.



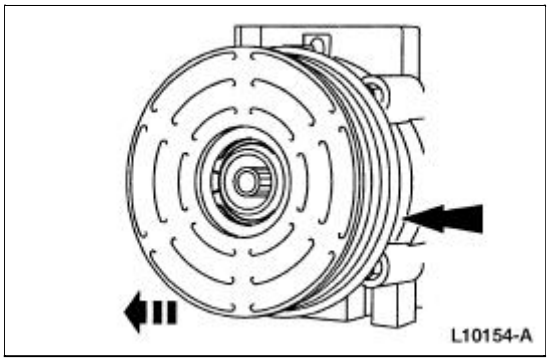
3. Remove the A/C disc and hub assembly and the A/C clutch hub spacer (19D648).
    1. Thread an 8 x 1.25 mm bolt into the A/C clutch to force it from the compressor shaft.
    2. Lift the A/C disc and hub assembly and the A/C clutch hub spacer from the compressor shaft.



4. Remove the pulley snap ring.

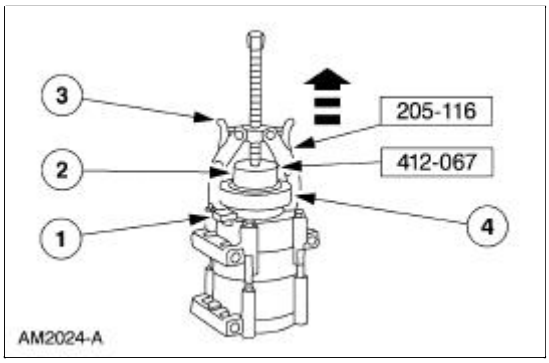


5. Remove the A/C clutch pulley (2E884).



6. **CAUTION: Do not use air tools. The A/C clutch field coil (19D798) can be easily damaged.**

   Remove the A/C clutch field coil.
   1. Note the location of the A/C clutch field coil electrical connector.
   2. Install the special tool on the nose opening of the A/C compressor.
   3. Install the special tool.
   4. Remove the A/C clutch field coil.

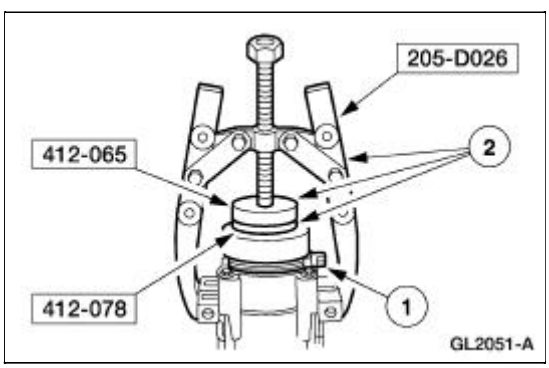


Installation

1. Clean the A/C disc and field coil and pulley mounting surfaces.

2. **CAUTION: Do not use air tools. The A/C clutch field coil can be easily damaged.**

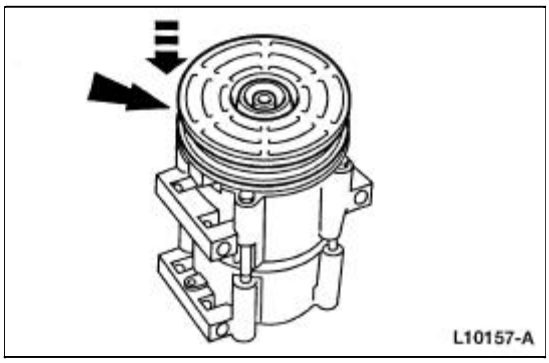
   Install the A/C clutch field coil.
   1. Place the A/C clutch field coil on the A/C compressor with the A/C clutch field coil electrical connector correctly positioned.
   2. Using the special tools, install the A/C field coil.



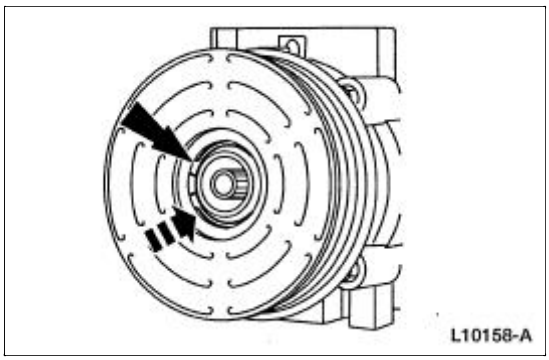
3. **NOTE:** The A/C clutch pulley is a tight fit on the A/C compressor head. It must be correctly

aligned during installation.

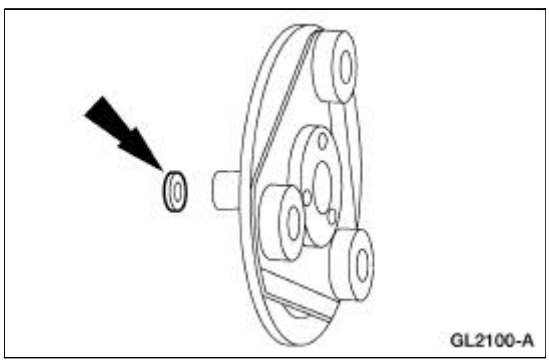
Install the A/C clutch pulley.



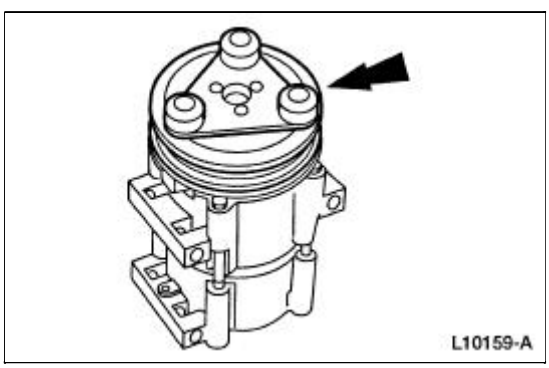
4. Install the pulley snap ring with the bevel side out.



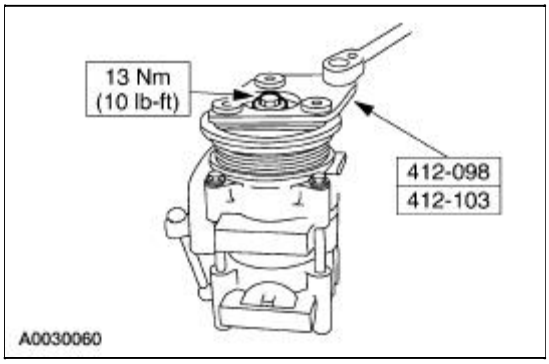
5. Place one nominal thickness A/C clutch hub spacer inside the clutch hub spline opening.



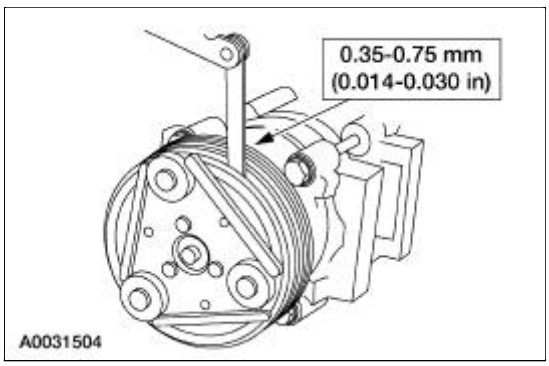
6. Install the A/C clutch.



7. Using the special tool, install the A/C disc and hub assembly retaining bolt.



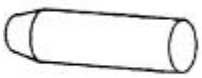
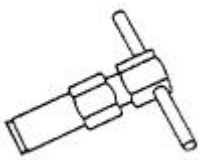
8. Measure and adjust the clutch air gap by removing or adding A/C clutch hub spacers.



9. Install the A/C compressor. For additional information, refer to Air Conditioning (A/C) Compressor—3.8L or Air Conditioning (A/C) Compressor—4.6L in this section.

Air Conditioning (A/C) Compressor Shaft Seal

Special Tool(s)

ST1235-A	Holding Fixture, Compressor Clutch (3.8L vehicles) 412-098 (T94P-19703-AH)
ST2584-A	Holding Fixture, Compressor Clutch (4.6L vehicles) 412-103 (T95L-19703-AH)
 ST1230-A	Protector, A/C Compressor Shaft Oil Seal 412-061 (T89P-19623-CH)
 ST1229-A	Remover, A/C Compressor Shaft Oil Seal 412-059 (T89P-19623-BH)
ST1228-A	Installer, A/C Compressor Shaft Oil Seal 412-058 (T89P-19623-AH)
ST1231-A	Remover, A/C Compressor Snap Ring 412-063 (T89P-19623-DH)
ST1219-A	Remover, O-ring Seal 100-010 (T71P-19703-C)

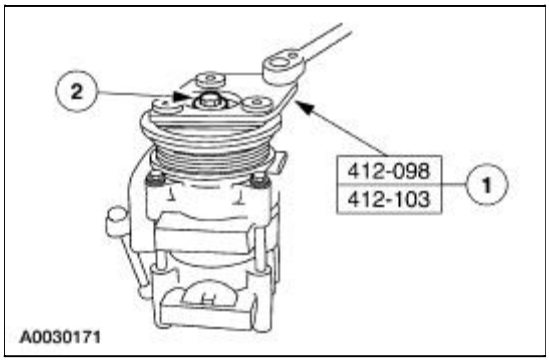
Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (MC YN-12-C)	WSH-M1C231-B

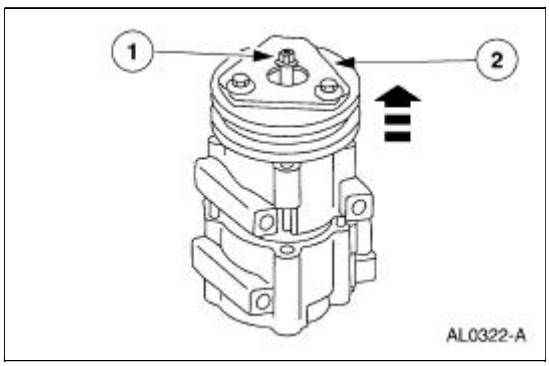
Removal

1. Remove the A/C compressor (19703). For additional information, refer to Air Conditioning (A/C) Compressor—3.8L or Air Conditioning (A/C) Compressor—4.6L in this section.

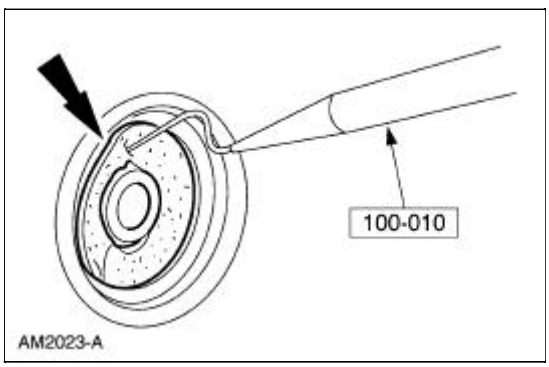
2. Remove the bolt.
    1. Hold the A/C disc and hub assembly (19D786) with the special tool.
    2. Remove the bolt.



3. Remove the A/C disc and hub assembly and spacer (19D648).
    1. Thread an 8 x 1.25 mm (0.05 in) bolt into the A/C disc and hub assembly to force it from the compressor shaft.
    2. Lift the A/C disc and hub assembly and spacer from the compressor shaft.

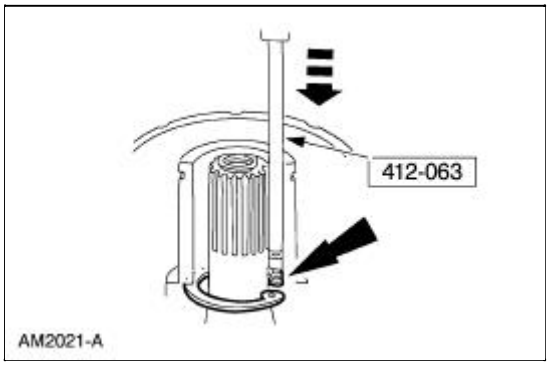


4. Using the special tool, remove the shaft seal felt from the nose of the A/C compressor.

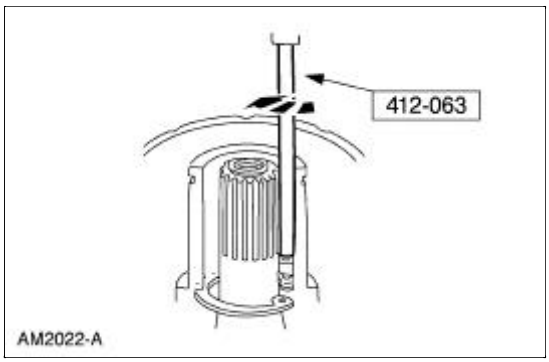


5. Clean the compressor nose area.

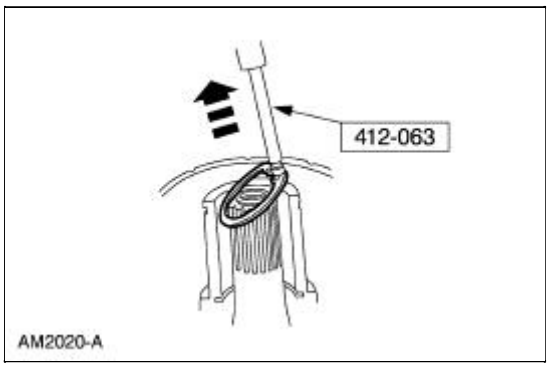
6. Insert the tip of the special tool into one of the snap ring eyes.



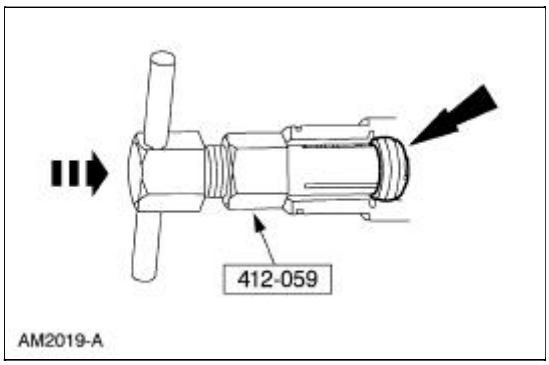
7. Rotate the special tool to position the tool tip and the snap ring eye closest to the A/C compressor shaft.



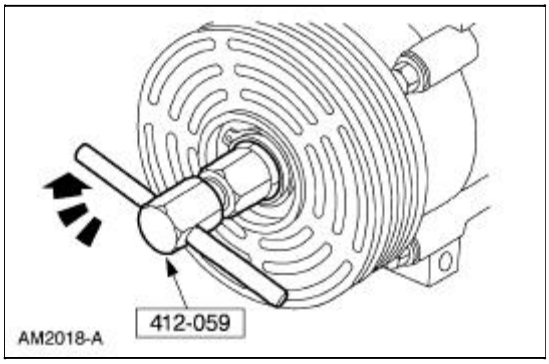
8. Pull the special tool up quickly while keeping the tool shaft against the side of the nose opening and remove the snap ring.



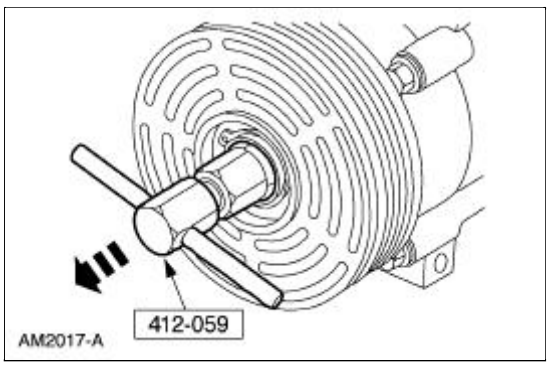
9. Engage the special tool into the inside diameter of the shaft seal.



10. Turn the tool handle clockwise to expand the tool tip inside the shaft seal.



11. Pull the seal from the A/C compressor.

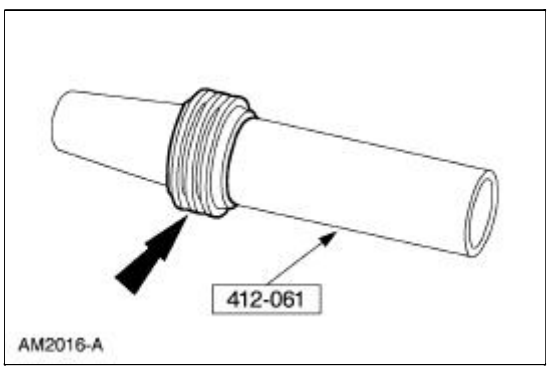


Installation

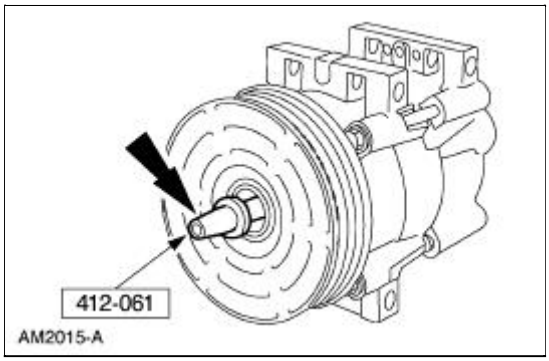
1. **CAUTION: To prevent refrigerant system contamination, do not allow dirt or other foreign materials to enter the A/C compressor.**

   Clean the A/C compressor nose area.

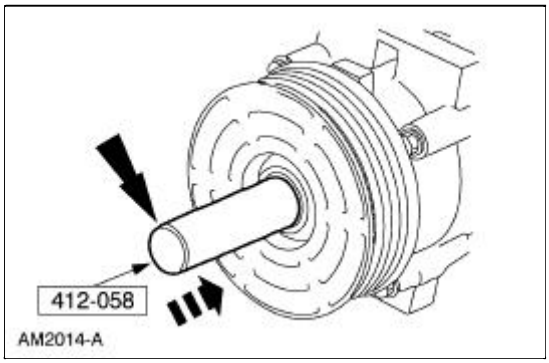
2. Place the shaft seal on the special tool. Lubricate the shaft seal and the special tool with PAG oil or equivalent.



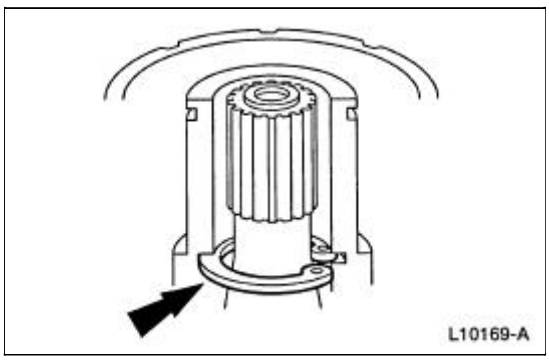
3. Position the shaft seal and the special tool over the A/C compressor shaft.



4. Using the special tool, push the shaft seal onto the A/C compressor shaft until seated.

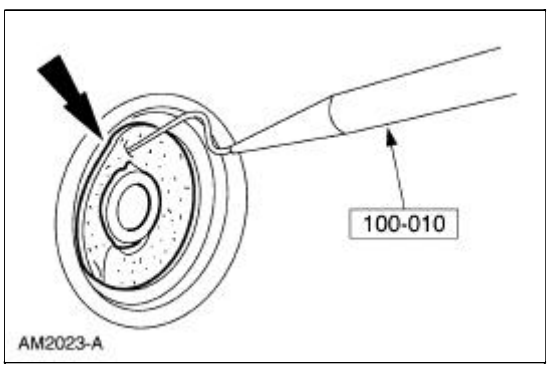


5. Install the shaft seal snap ring.

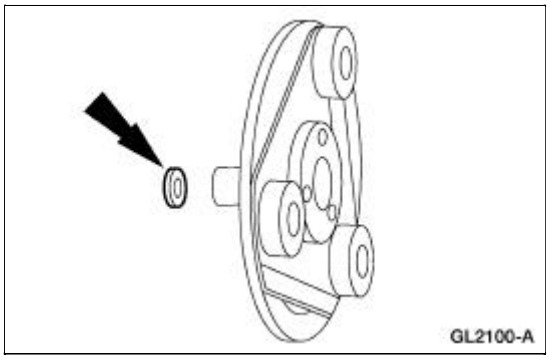


6. Carry out the A/C compressor external leak test. For additional information, refer to Component Tests in Section 412-00 .

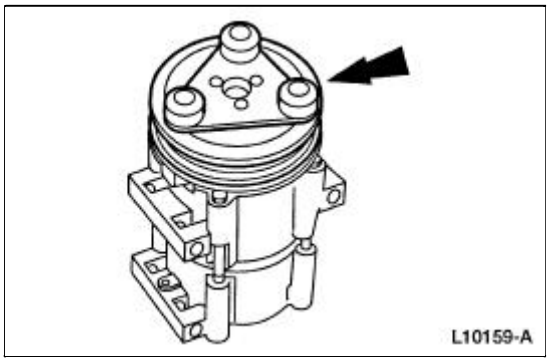
7. Install the shaft seal felt.



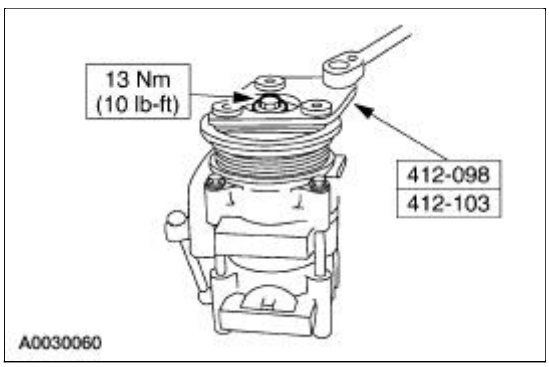
8. Install the A/C clutch hub spacer.



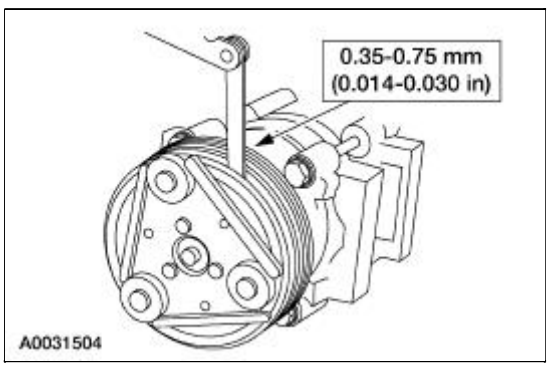
9. Install the A/C disc and hub assembly.



10. Using the special tool, install the A/C disc and hub assembly retaining bolt.



11. Measure and adjust the clutch air gap by removing or adding spacers as needed.



12. Install the A/C compressor. For additional information, refer to Air Conditioning (A/C) Compressor—3.8L or Air Conditioning (A/C) Compressor—4.6L in this section.

Evaporator Core

Removal and Installation

NOTE: The evaporator core is not separately serviceable, it is serviced only with the evaporator core housing assembly.

NOTE: Installation of a new suction accumulator is not required when repairing the air conditioning system except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator.

NOTE: If an evaporator core leak is suspected, the evaporator core must be leak tested before it is removed from the vehicle. For additional information, refer to Section 412-00 .

1. Remove the evaporator core housing. For additional information, refer to Section 412-02 .
2. Transfer the components from the old evaporator core housing to the new evaporator core housing.
3. Install the evaporator core housing. For additional information, refer to Section 412-02 .

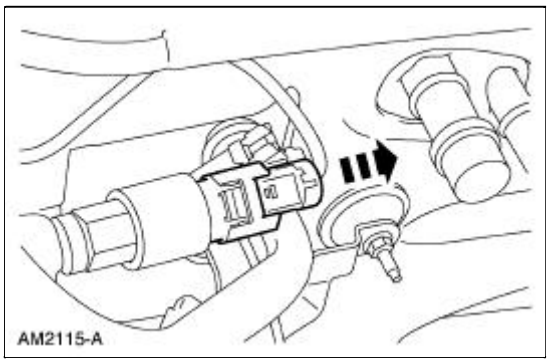
Suction Accumulator

Material

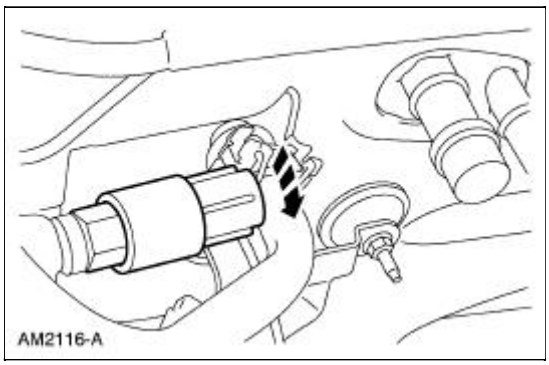
Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B

Removal and Installation

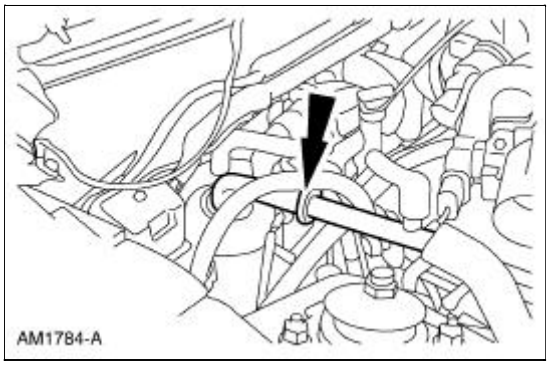
1. Recover the refrigerant. For additional information, refer to Section 412-00 .
2. Disconnect the A/C cycling switch electrical connector.



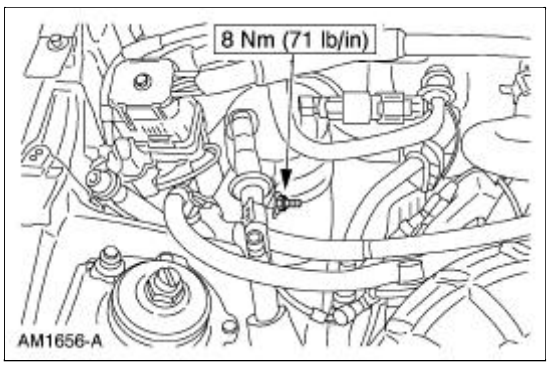
3. Remove the cycling switch.



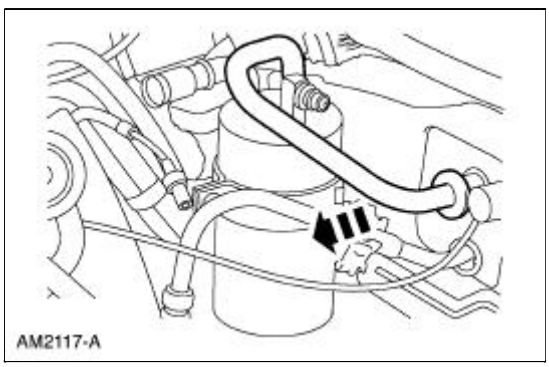
4. Disconnect the suction line spring lock coupling.
   - Discard the O-ring seals.



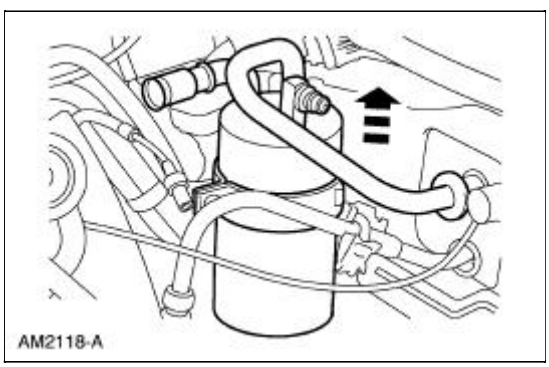
5. Remove the clamp nut.



6. Disconnect the suction accumulator from the evaporator outlet.
    - Discard the O-ring seals.



7. Remove the suction accumulator.



8. To install, reverse the removal procedure.
    - Install new O-ring seals lubricated in clean PAG oil.

- Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Section 412-00 .

9. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

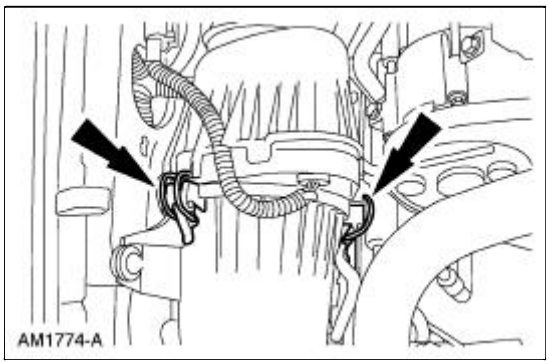
Air Conditioning (A/C) Pressure Relief Valve —3.8L

Material

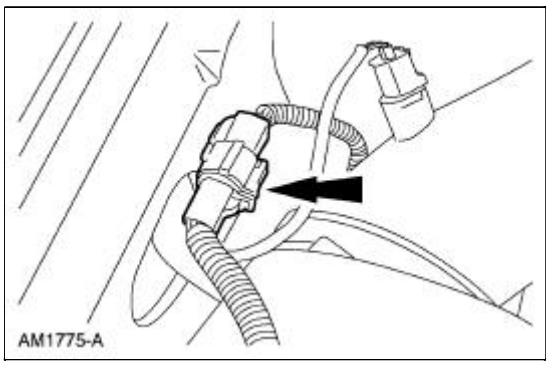
Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B

Removal and Installation

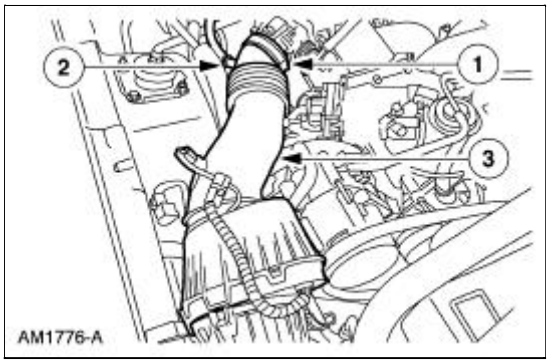
1. Recover the refrigerant. For additional information, refer to Section 412-00 .
2. Unlatch the breather.



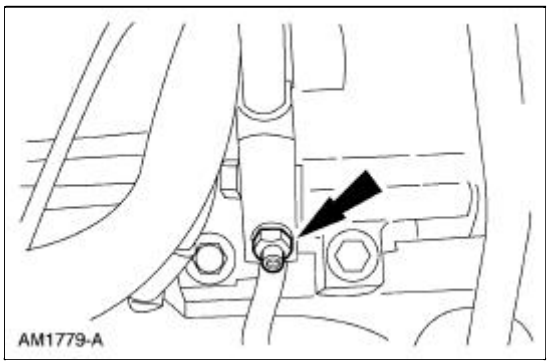
3. Disconnect the mass air flow (MAF) sensor electrical connector.



4. Remove the air cleaner outlet tube.
    1. Loosen the clamp.
    2. Disconnect the crankcase ventilation tube.
    3. Remove the air cleaner outlet tube.



5. Remove the A/C compressor pressure relief valve.
    - Discard the O-ring seal.



6. To install, reverse the removal procedure.
    - Install a new O-ring seal lubricated in clean PAG oil.

7. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

Air Conditioning (A/C) Pressure Relief Valve —4.6L

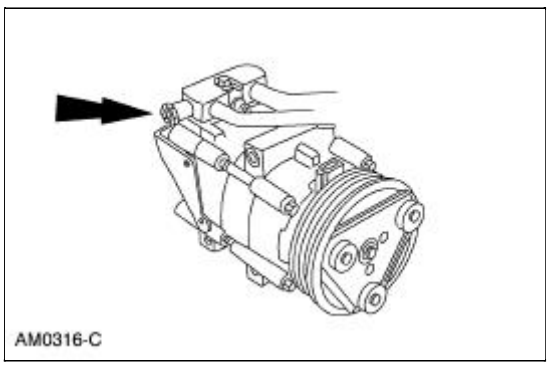
Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B

Removal and Installation

NOTE: Installation of a new suction accumulator is not required when repairing the air conditioning system except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator.

1. Recover the refrigerant. For additional information, refer to Section 412-00 .
2. Raise the vehicle. For additional information, refer to Section 100-02 .
3. Remove the A/C compressor pressure relief valve (19D644).
   - Discard the O-ring seal.



4. To install, reverse the removal procedure.
   - Install a new O-ring seal lubricated in clean PAG oil.

Condenser Core

Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B

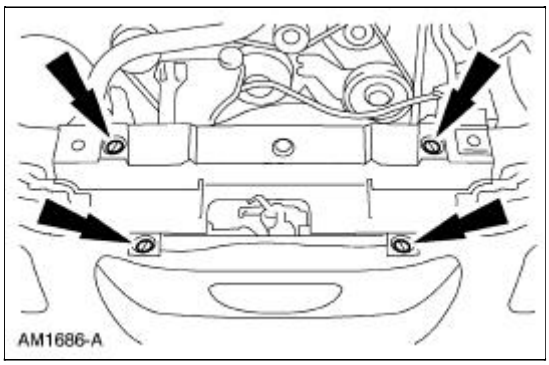
Removal and Installation

NOTE: If an A/C condenser core leak is suspected, the A/C condenser core must be leak tested before it is removed from the vehicle. For additional information, refer to Section 412-00 .

NOTE: Installation of a new suction accumulator is not required when repairing the air conditioning system except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator.

All vehicles

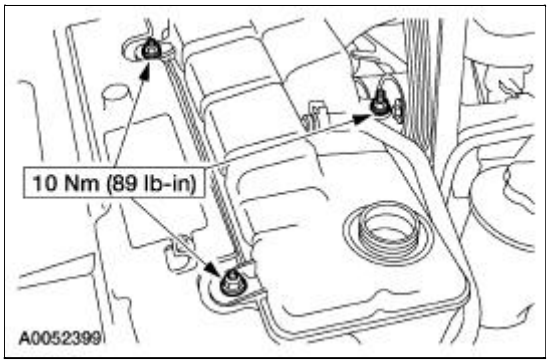
1. Recover the refrigerant. For additional information, refer to Section 412-00 .
2. Remove the pin-type retainers and remove the upper radiator sight shield.



3. Remove the air cleaner and air cleaner outlet tube. For additional information, refer to Section 303-12 .

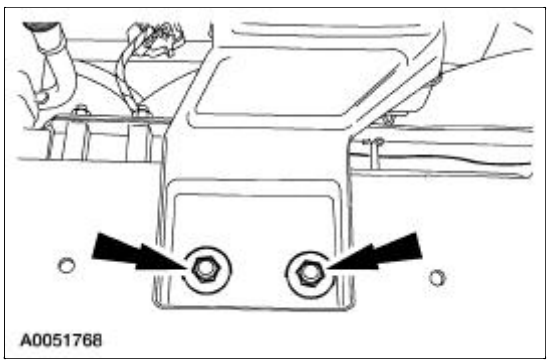
4.6L (2V), 4.6L (4V) vehicles

4. Remove the bolts and position the coolant bottle aside.



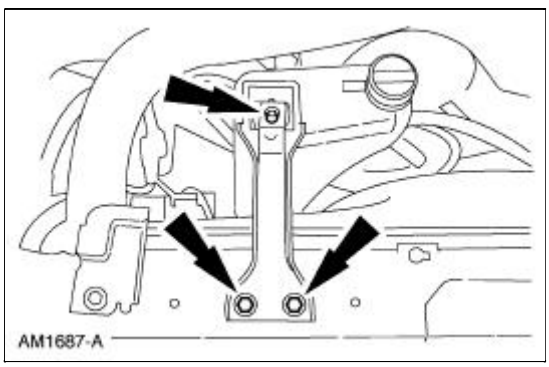
4.6L (4V) vehicles

5. Remove the bolts and position the coolant bottle aside.

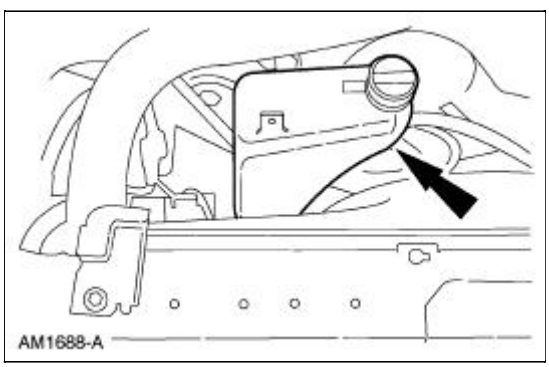


3.8L vehicles

6. Remove the bolts.

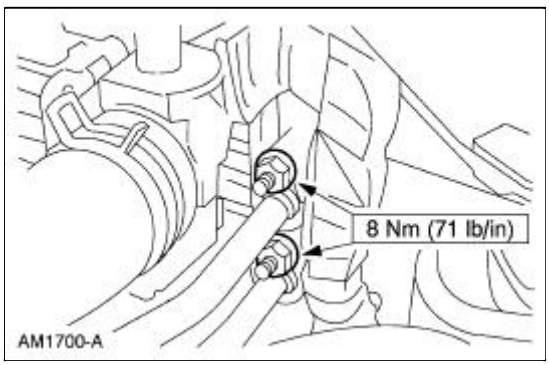


7. Remove the bracket and the coolant bottle.



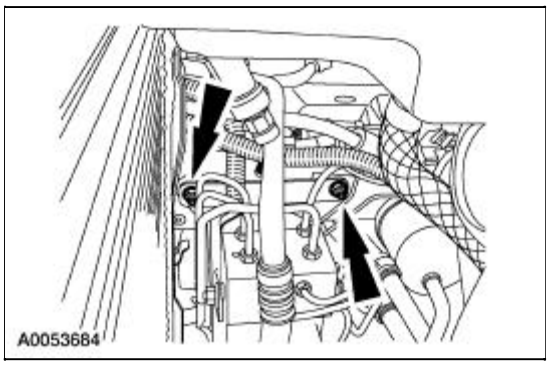
All vehicles

8. Remove the nuts and disconnect the lines.
    - Discard the O-ring seals.



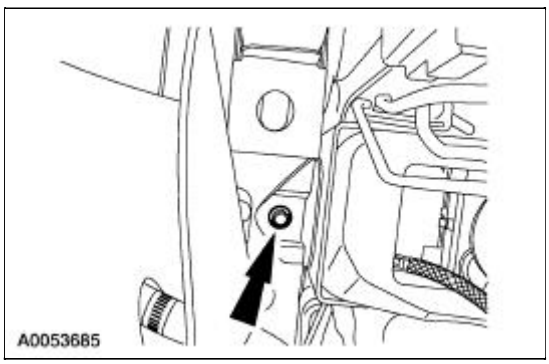
Vehicles with 4WABS

9. Remove the hydraulic control unit upper bracket bolts.



10. Raise the vehicle.

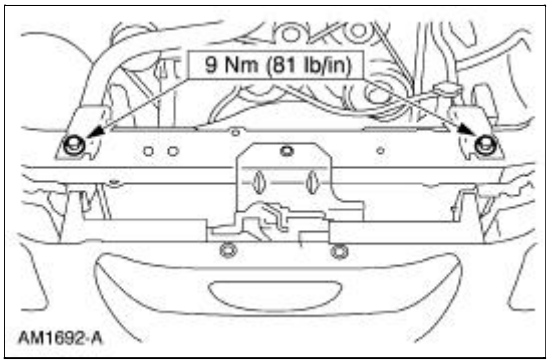
11. Remove the hydraulic control unit lower bracket bolt and position the hydraulic control unit aside.



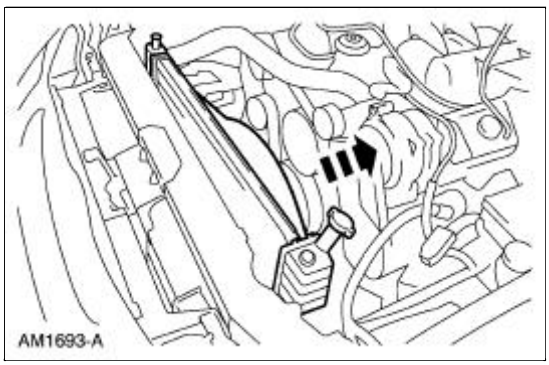
12. Lower the vehicle.

All vehicles

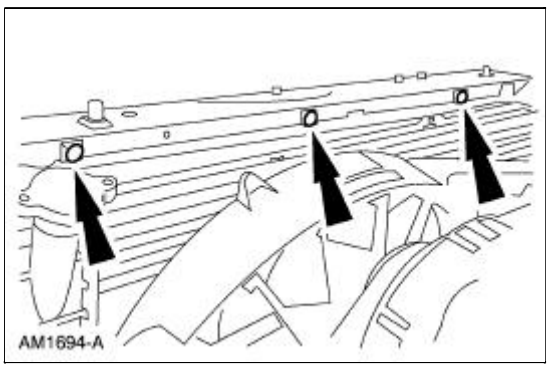
13. Remove the bolts and the radiator brackets.



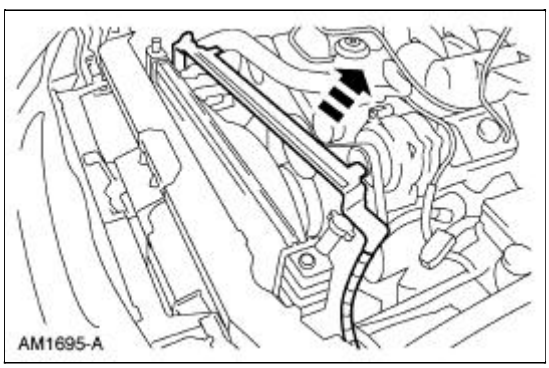
14. Position the radiator rearward.



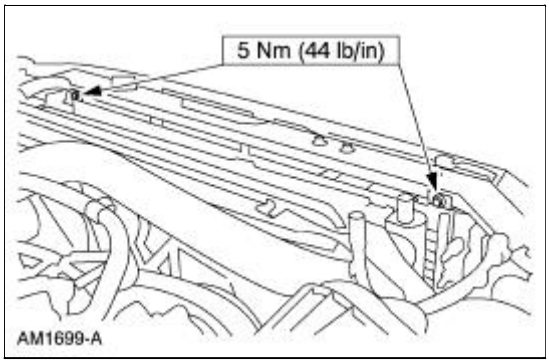
15. Remove the pin-type retainers.



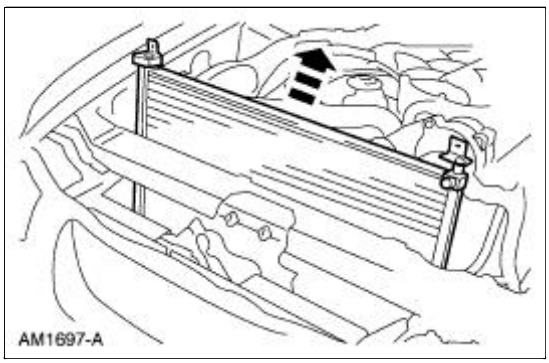
16. Position the wiring harness rearward.



17. Remove the condenser bolts.



18. Remove the condenser core.



19. To install, reverse the removal procedure.
    - Install new O-ring seals lubricated in clean PAG oil.
    - Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Section 412-00 .

20. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

Compressor Manifold and Tube Assembly —3.8L

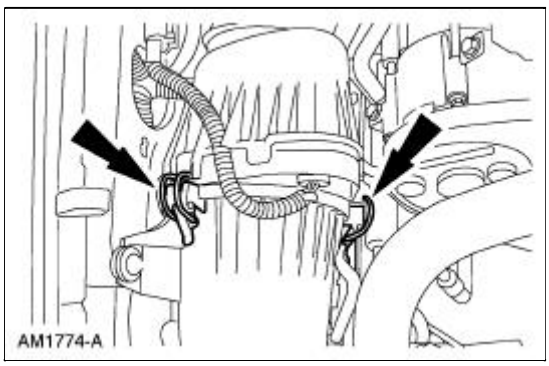
Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B

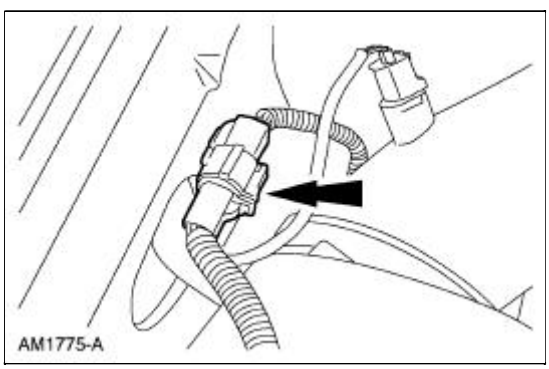
Removal and Installation

NOTE: Installation of a new suction accumulator is not required when repairing the air conditioning system except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator.

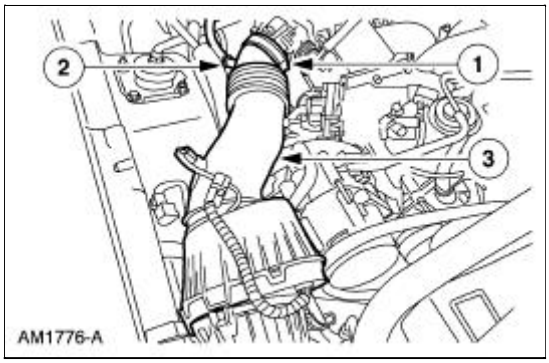
1. Recover the refrigerant. For additional information, refer to Section 412-00 .
2. Unlatch the air breather.



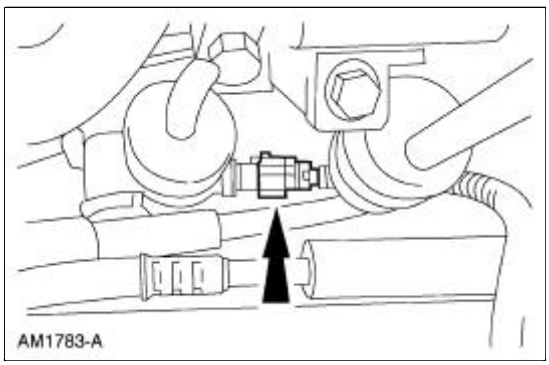
3. Disconnect the mass air flow (MAF) sensor electrical connector.



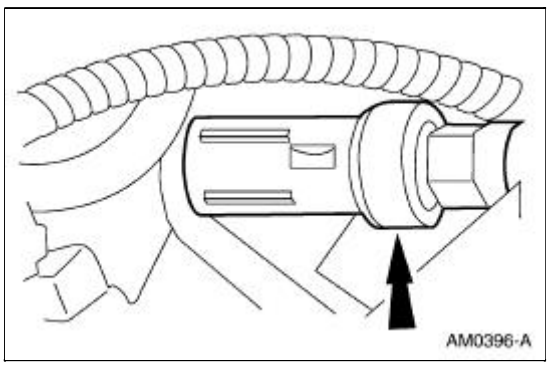
4. Remove the air cleaner outlet tube.
    1. Loosen the clamp.
    2. Disconnect the crankcase ventilation tube.
    3. Remove the air cleaner outlet tube.



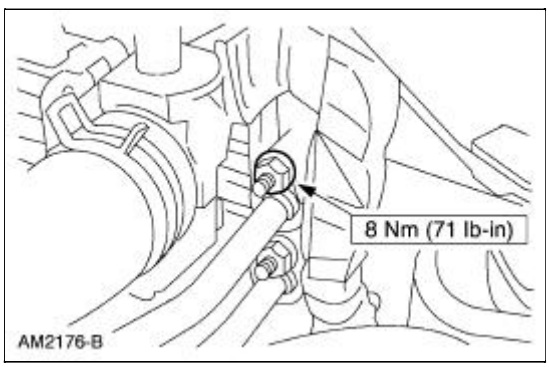
5. Disconnect the refrigerant containment switch (RCS) electrical connector.



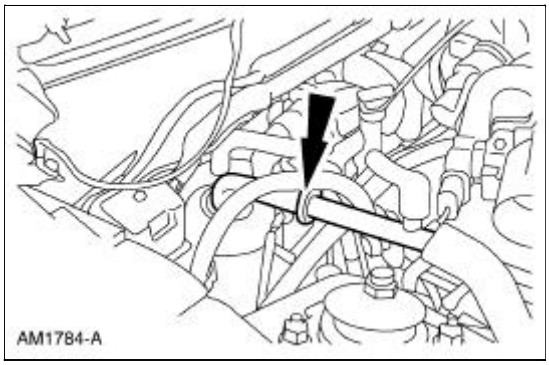
6. Remove the RCS.



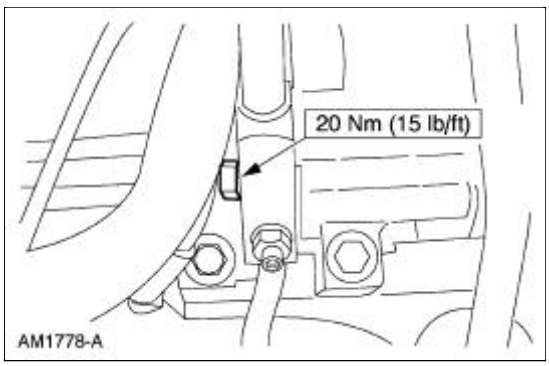
7. Remove the nut and disconnect A/C fitting.
    - Discard the O-ring seal.



8. Disconnect the spring lock coupling.
    - Discard the O-ring seals.



9. Remove the bolt.



10. Remove the manifold and tube assembly.
    - Discard the O-ring seals.

11. To install, reverse the removal procedure.
    - Install new O-ring seals lubricated in clean PAG oil.
    - Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Section 412-00 .

12. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

Compressor Manifold and Tube Assembly —4.6L

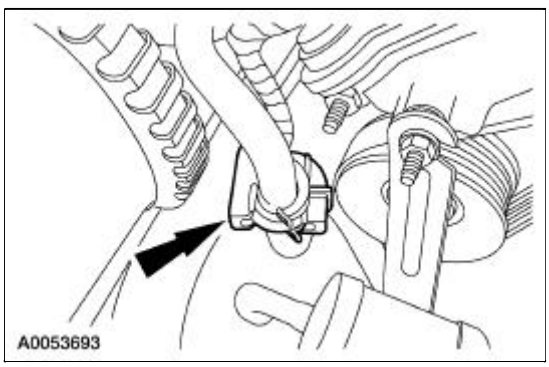
Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B

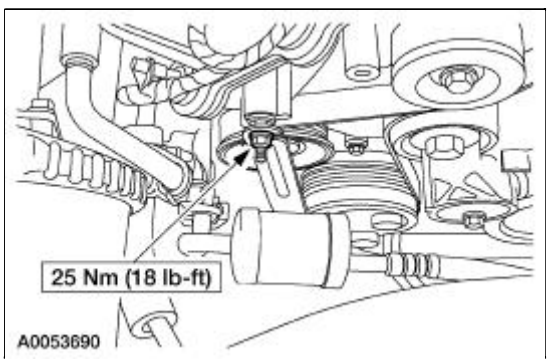
Removal and Installation

NOTE: Installation of a new suction accumulator is not required when repairing the air conditioning system except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator.

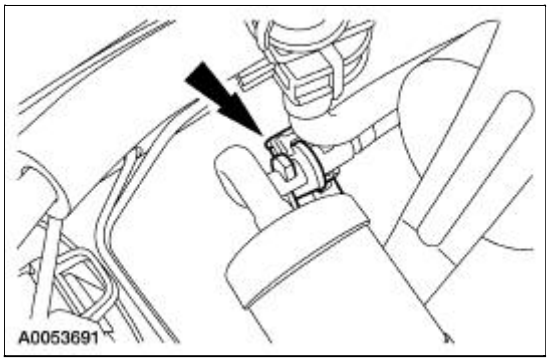
1. Recover the refrigerant. For additional information, refer to Section 412-00 .
2. Disconnect the suction line spring lock coupling.
   - Discard the O-ring seals.



3. Remove the A/C muffler bracket nut.

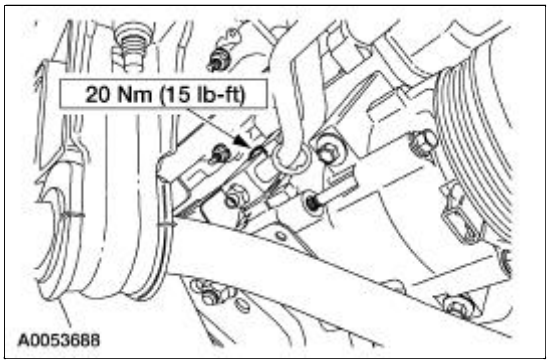


4. Disconnect the spring lock coupling.
   - Discard the O-ring seals.



5. Raise the vehicle. For additional information, refer to Section 100-02 .

6. Remove the bolt and the compressor manifold assembly.
   - Discard the O-ring seals.



7. To install, reverse the removal procedure.
   - Install new O-ring seals lubricated in clean PAG oil.
   - Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Section 412-00 .

8. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

Suction Accumulator to Compressor Line —4.6L

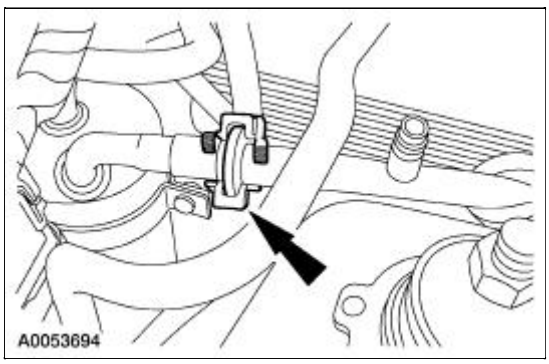
Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B

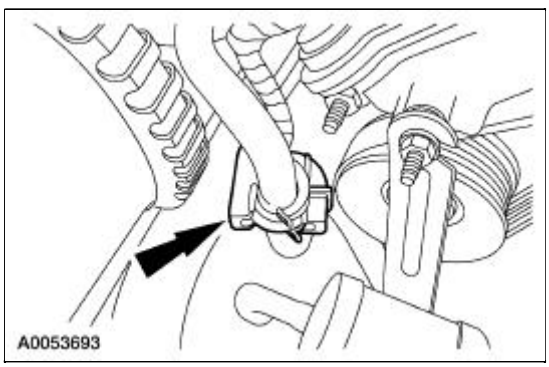
Removal and Installation

NOTE: Installation of a new suction accumulator is not required when repairing the air conditioning system except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator.

1. Recover the refrigerant. For additional information, refer to Section 412-00 .
2. Remove the air cleaner outlet tube. For additional information, refer to Section 303-12 .
3. Disconnect the spring lock coupling at the suction accumulator.
   - Discard the O-ring seals.



4. Disconnect the spring lock coupling at the compressor manifold.
   - Discard the O-ring seals.



5. Remove the suction accumulator to compressor line.

6. To install, reverse the removal procedure.
    - Install new O-ring seals lubricated in clean PAG oil.
    - Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Section 412-00 .
7. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

Compressor to Condenser Discharge Line —4.6L

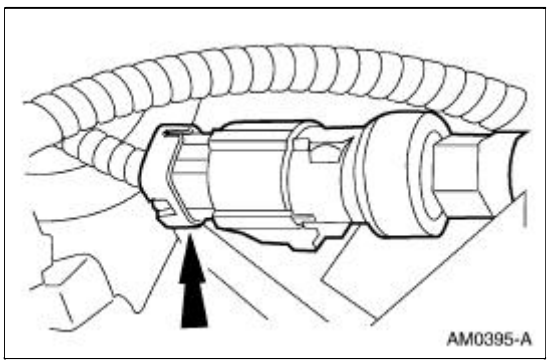
Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B

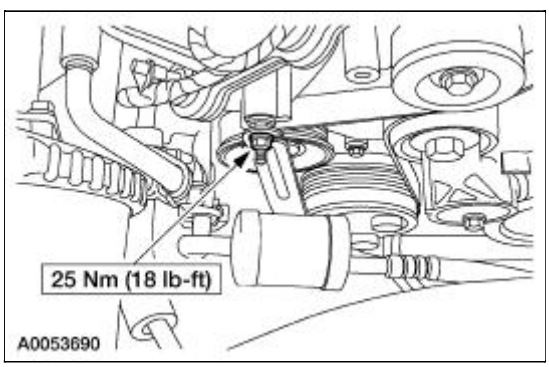
Removal and Installation

NOTE: Installation of a new suction accumulator is not required when repairing the air conditioning system except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator.

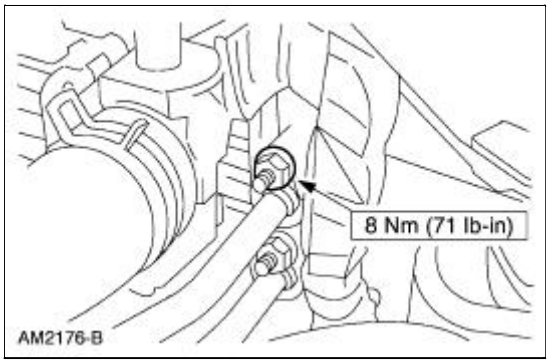
1. Recover the refrigerant. For additional information, refer to Section 412-00 .
2. Disconnect the dual-function pressure switch electrical connector and remove the switch.



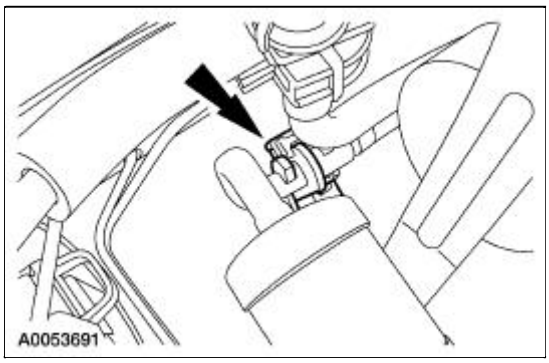
3. Remove the A/C muffler bracket nut.



4. Disconnect the fitting at the condenser.
   - Discard the O-ring seal.



5. Disconnect the spring lock coupling at the compressor manifold and tube.
   - Discard the O-ring seals.



6. Remove the compressor to condenser discharge line.

7. To install, reverse the removal procedure.
   - Install new O-ring seals lubricated in clean PAG oil. For additional information, refer to Section 412-00 .
   - Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Section 412-00 .

8. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

Condenser to Evaporator Line

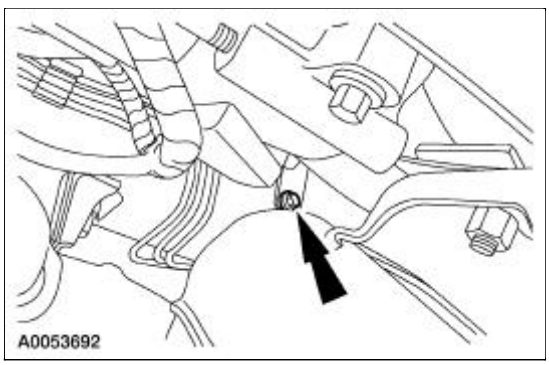
Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B

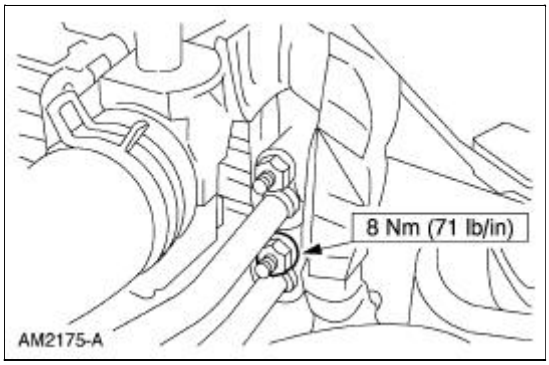
Removal and Installation

NOTE: Installation of a new suction accumulator is not required when repairing the air conditioning system except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator.

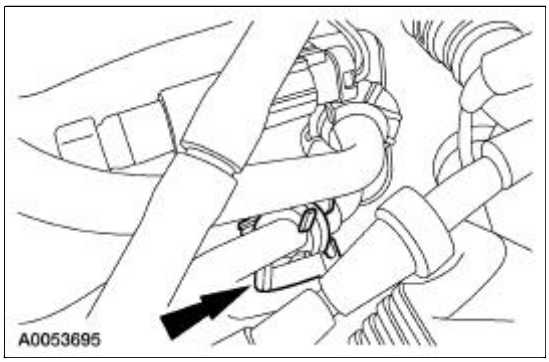
1. Recover the refrigerant. For additional information, refer to Section 412-00 .
2. Remove the air cleaner outlet tube. For additional information, refer to Section 303-12 .
3. Raise the vehicle. For additional information, refer to Section 100-02 .
4. Remove the line bracket pin-type retainer.



5. Lower the vehicle.
6. Remove the nut and disconnect the fitting at the condenser.
   - Discard the O-ring seal.



7. Disconnect the spring lock coupling at the evaporator core.
    - Discard the O-ring seals.



8. Remove the condenser to evaporator line.

9. To install, reverse the removal procedure.
    - Install new O-ring seals lubricated in clean PAG oil.
    - Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Section 412-00 .

10. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

Control Components

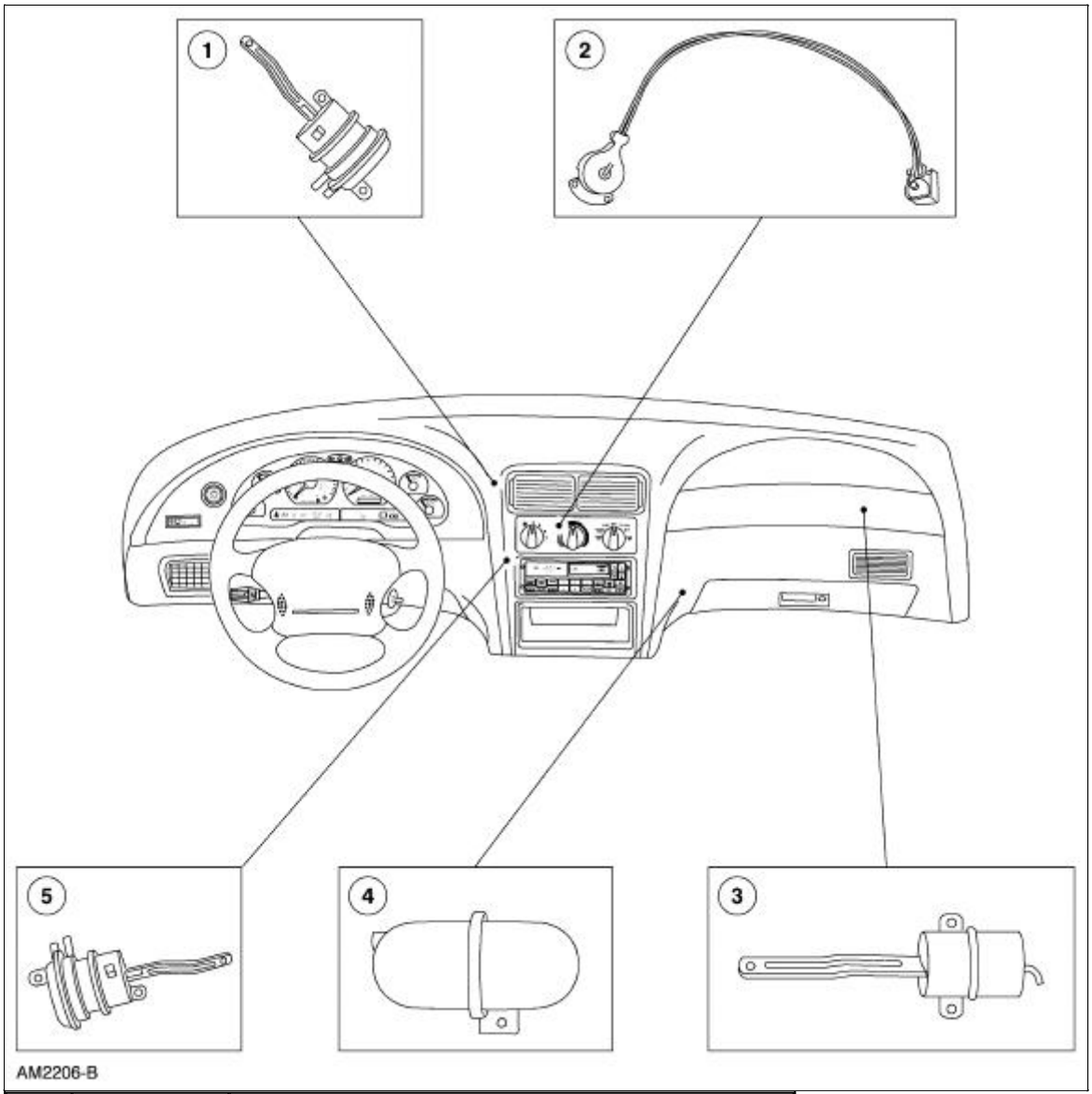
Manual A/C

The climate control system heats or cools the vehicle interior depending on the function selector position and the temperature selected. Function selector position determines heating or cooling and air distribution. The temperature blend control setting determines air temperature.

The manual climate control components are used to:

- select air inlet source (outside or recirculated).
- select blower motor speed.
- select discharge air temperature (temperature blend).
- select discharge air location (defrost, panel, floor).
- select A/C compressor clutch operation.

Component Locations



Item	Part Number	Description
1	18A318	Vacuum control motor (panel/defrost door)
2	19988	Temperature blend door actuator cable
3	18A318	Vacuum control motor (air inlet door)
4		A/C vacuum reservoir tank and bracket (part of 18454)
5	18A318	Vacuum control motor (floor/panel door)

Control System Inputs

Climate Control Assembly

The climate control assembly has three system controls:

- The blower motor switch controls blower motor speed by adding or bypassing resistors in the heater blower motor resistor.
- The temperature selection is accomplished with a manually-controlled blend door actuator that controls positioning of the temperature blend door. Movement of the control knob (18519) from

COOL (blue) to WARM (red) causes a corresponding movement on the air temperature control door and determines the temperature that the system will maintain.

- The A/C heater function selector switch combines a vacuum selector valve for direct control of the vacuum control motors and electrical input to the instrument control module.

Control System Outputs

Blower Motor Switch Resistor

The heater blower motor switch resistor has the following features:

- The assembly is located on the passenger side of the plenum assembly behind the glove compartment (06010).
- Three resistance elements are mounted on the resistor board to provide four A/C blower motor speeds.
- Depending on the heater blower motor switch position, series resistance is added or bypassed in the A/C blower motor circuit to decrease or increase A/C blower motor speed.
- An overheating protective device (thermal limiter) will open the resistor coil circuit when the temperature reaches 105°-110°C (221°-230°F), interrupting the blower motor operation in all speeds except HI.
- The thermal limiter cannot be reset and is not serviceable.

Control Actuators

Temperature Control Cable

The temperature control cable (19988) has the following features:

- The cable assembly has a constant tension (pull-pull) dual cable design.
- The pull-pull design allows for constant smooth communication between the temperature control knob and the air temperature blend door.
- The control cable can only be installed as an assembly.

Vacuum Control Motors

The vacuum control motors (18A318) control the position of the doors directing the air flow to the different outlets. There are two types of vacuum control motors used in this system:

- Single-diaphragm for air inlet and windshield defroster door operations.
- Double-diaphragm for air damper door operations.

Single-diaphragm motors have two positions:

- Shaft extended with no vacuum applied.
- Shaft retracted with vacuum applied.

Double-diaphragm motors have three positions:

- Shaft extended with no vacuum applied to either port.
- Shaft halfway retracted with vacuum applied to only one port.

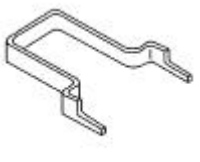
- Shaft fully retracted with vacuum applied to both ports.

Control Components

Refer to Section 412-00 .

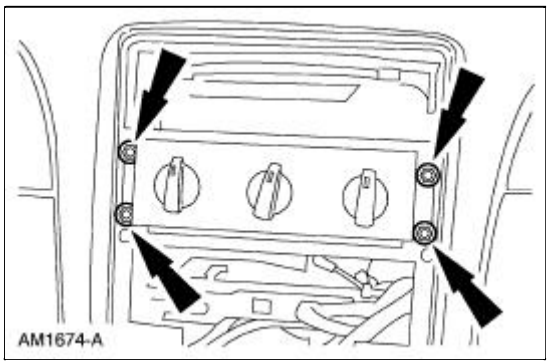
Control Assembly

Special Tool(s)

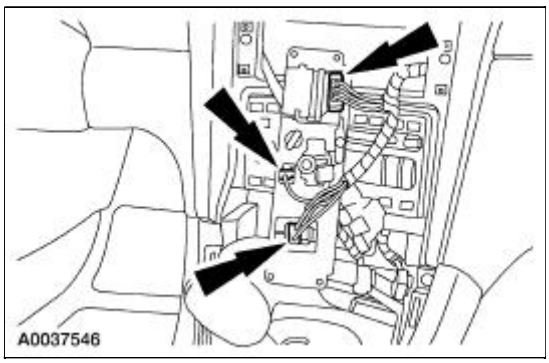
 ST2198-A	Remover, Heater Control Cable Retainer 412-088 (T94P-18532-A)

Removal

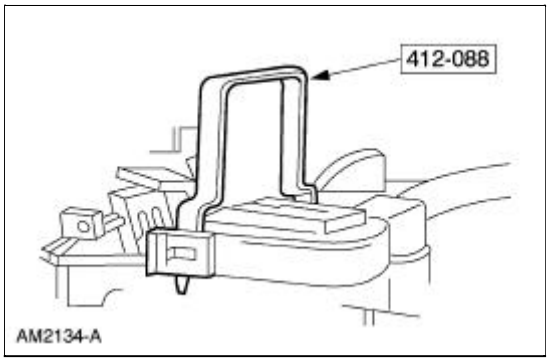
1. Remove the center instrument panel register. For additional information, refer to Section 412-01 .
2. Remove the screws.


AM1674-A

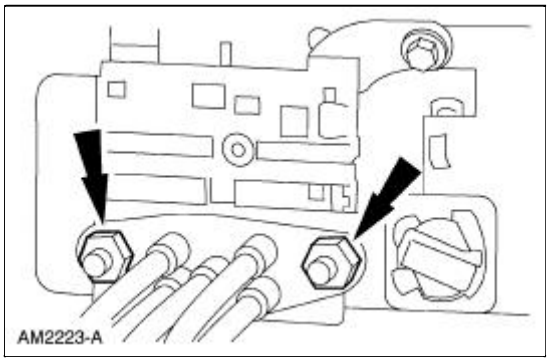
3. Disconnect the connectors.


A0037546

4. Using the special tool, disconnect the temperature control cable from the control head.

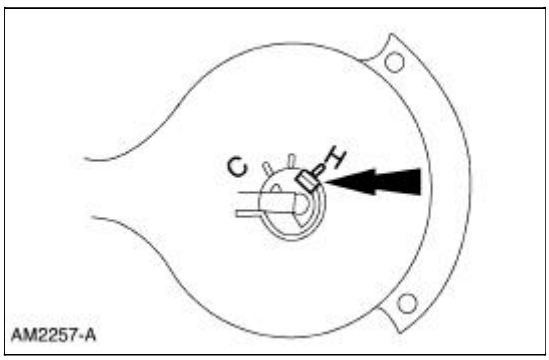


5. Remove the nuts and disconnect the vacuum connector.

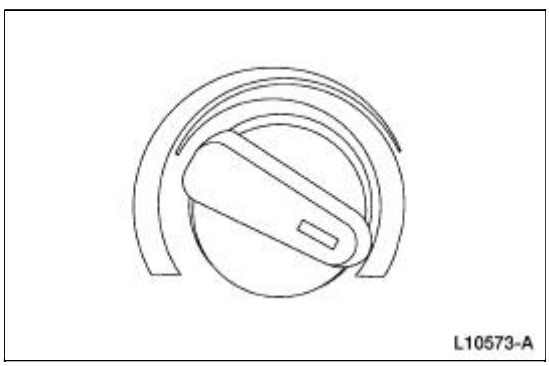


Installation

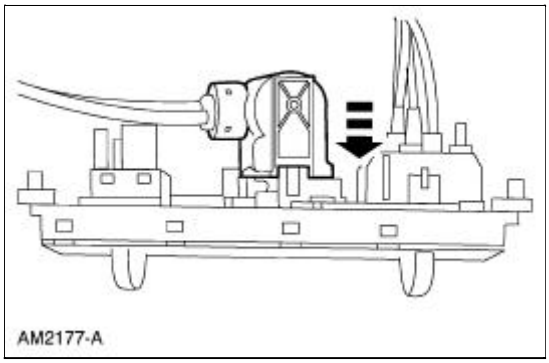
1. Align the blend door driver to the full heat position.



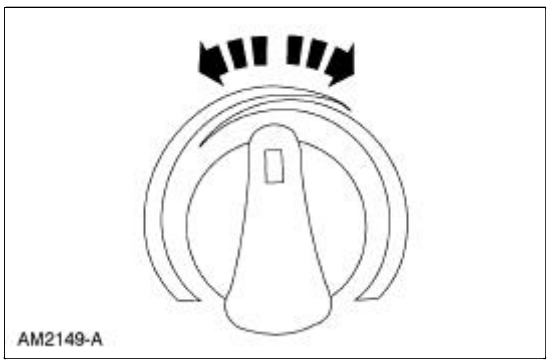
2. Place the temperature control knob in the full WARM position.



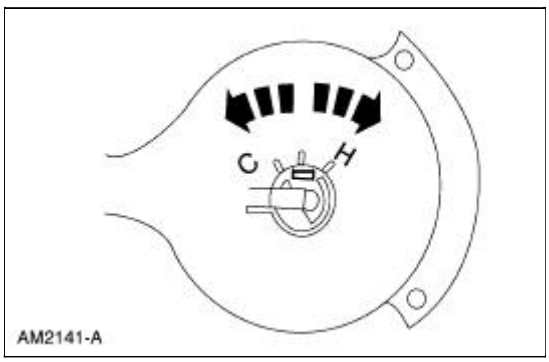
3. Attach the cable drive to the control head.



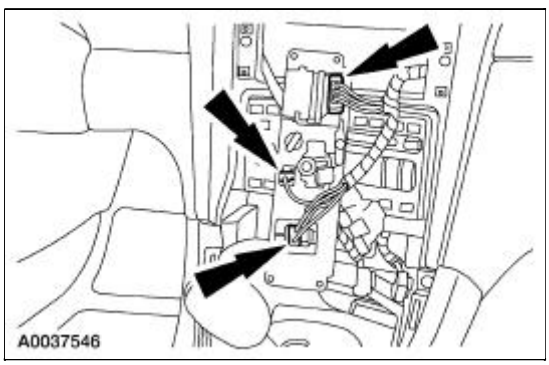
4. Rotate the knob back and forth from full WARM to full COOL.



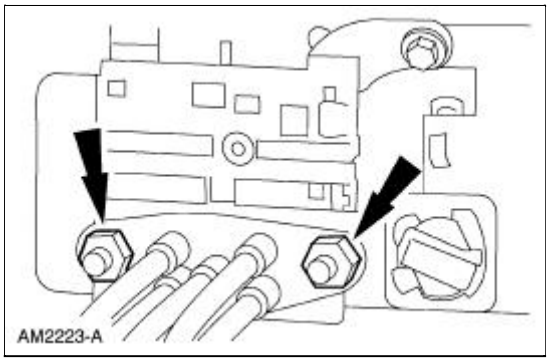
5. Check the cable control for correct range of movement.



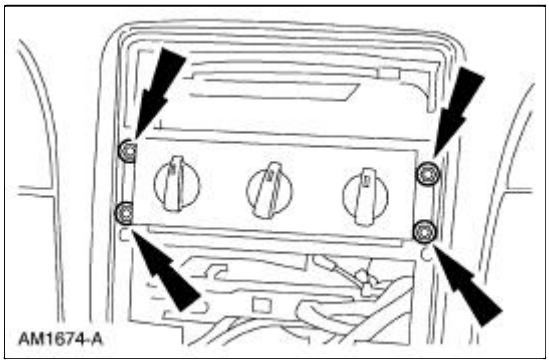
6. Connect the electrical connectors.



7. Install the vacuum connector and nuts.



8. Install the control head.



9. Install the center instrument panel register. For additional information, refer to Section 412-01 .

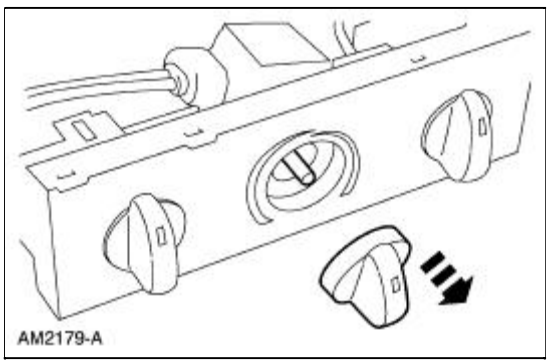
Switch

Removal

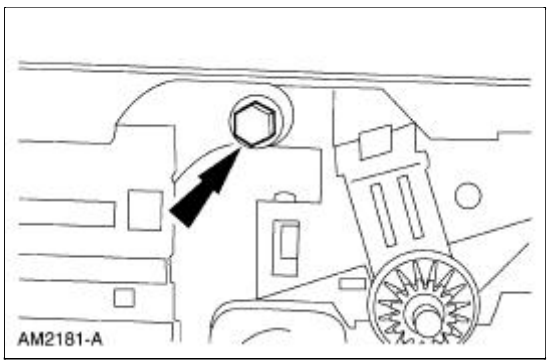
1. Remove the climate control assembly. For additional information, refer to Control Assembly in this section.

2. **NOTE:** All three switches are removed the same.

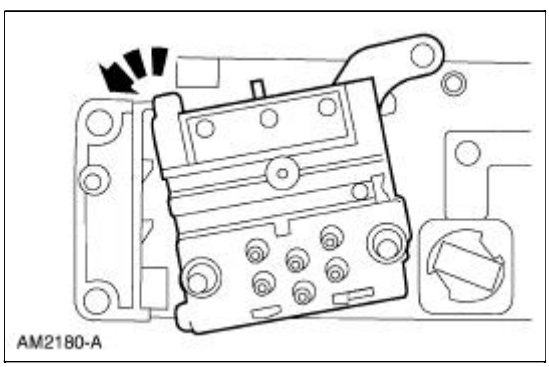
   Remove the knob.



3. Remove the screw.



4. Rotate the switch and remove it from the control head assembly.



Installation

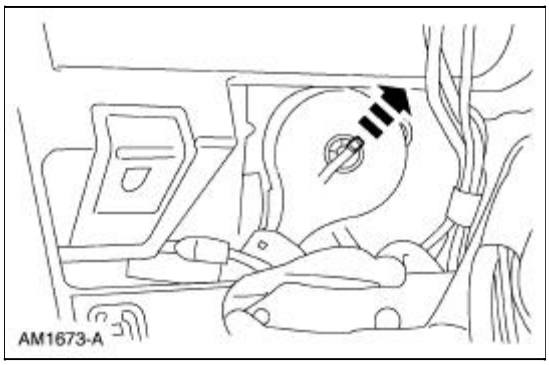
1. To install, reverse the removal procedure.

Actuator —Temperature Control Cable

Removal

1. Remove the control assembly. For additional information, refer to Control Assembly in this section.

2. Unsnap and remove the drive assembly.



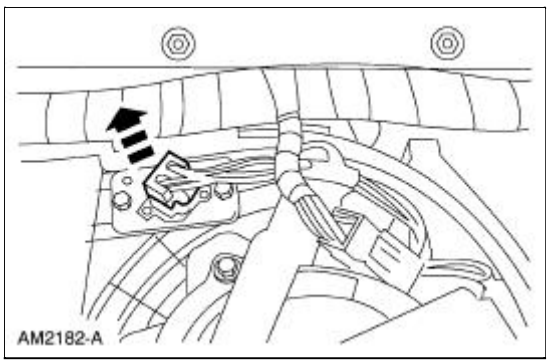
Installation

1. To install, reverse the removal procedure.

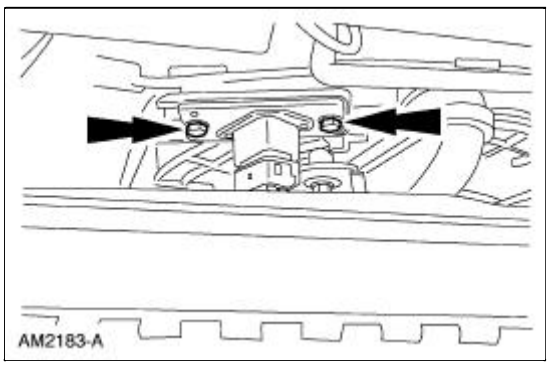
Resistor

Removal

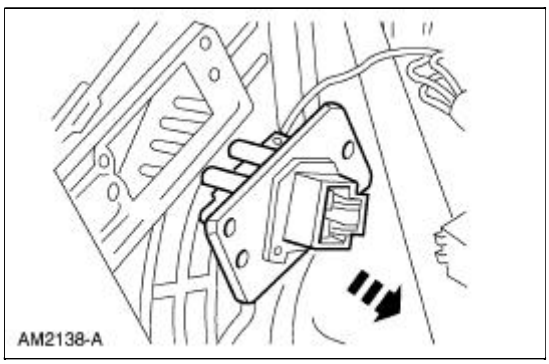
1. Disconnect the connector.



2. Remove the screws.



3. Remove the resistor.



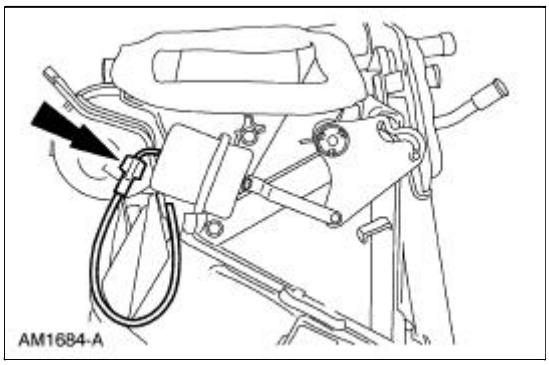
Installation

1. To install, reverse the removal procedure.

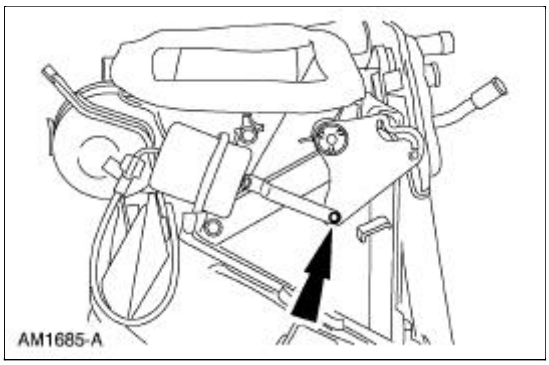
Vacuum Control Motor —Air Inlet Duct Door

Removal

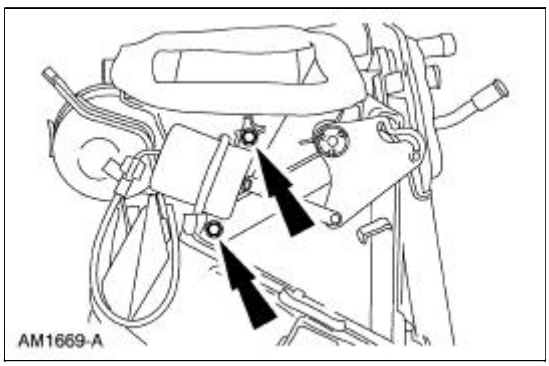
1. Remove the instrument panel. For additional information, refer to Section 501-12 .
2. Disconnect the vacuum hose.



3. Disconnect the control arm.



4. Remove the vacuum control motor.
   - Remove the screws.



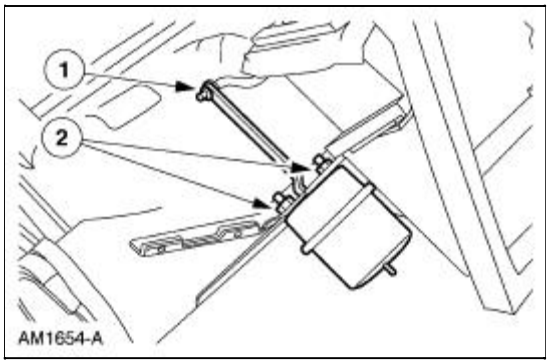
Installation

1. To install, reverse the removal procedure.

Vacuum Control Motor —Air Damper Door

Removal

1. Remove the instrument panel. For additional information, refer to Section 501-12 .
2. Disconnect the vacuum hose.
3. Remove the vacuum control motor.
    1. Remove the steel clip.
    2. Loosen the nuts.



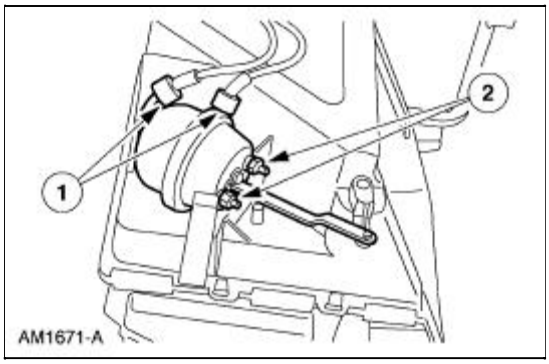
Installation

1. To install, reverse the removal procedure.

Vacuum Control Motor —Windshield/Defroster Door

Removal

1. Remove the instrument panel. For additional information, refer to Section 501-12 .
2. Unclip the control arm.
3. Remove the vacuum control motor.
    1. Disconnect the vacuum lines.
    2. Loosen the nuts.



Installation

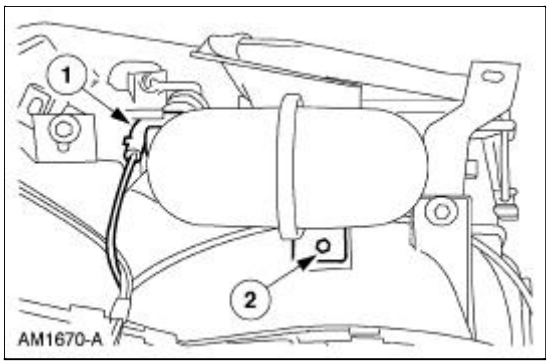
1. To install, reverse the removal procedure.

Vacuum Reservoir Tank

Removal

1. Access the vacuum reservoir tank through the glove compartment.

2. Remove the reservoir.
    1. Disconnect the vacuum connector.
    2. Remove the screw.



Installation

1. To install, reverse the removal procedure.